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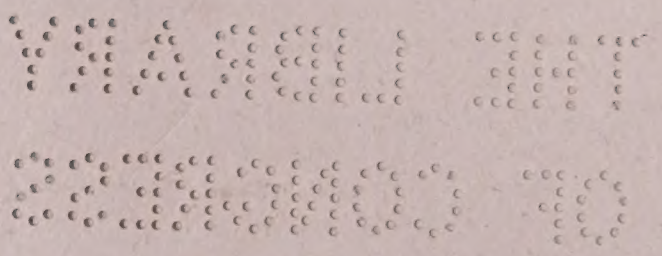


Cau'liflower, a garden variety of cabbage, in which cultivation has caused the inflorescence to assume when young the form of a compact, fleshy head, which is highly esteemed as a table vegetable. Broccoli is much the same.

Caulking (kạk'ing), of a ship, driving a quantity of oakum into the seams of the planks in the ship's decks or sides in order to prevent the entrance of water. After the oakum is driven very hard into these seams it is covered with hot melted pitch to keep the water from rotting it.

Cause, that which produces an effect; that from which anything proceeds and without which it would not exist. In the system of Aristotle the word rendered cause and its equivalents in modern language has a most extensive signification. He divides causes into four kinds: efficient, formal, material, and final. The efficient or first cause is the force or agency by which a result is produced; the formal, the means or instrument by which it is produced; the material, the substance from which it is produced; the final, the purpose or end for which it is produced. In a general sense the term is used for the reason or motive that urges, moves, or impels the mind to act or decide.

Caustic, a name given to substances which have the property of burning, corroding, or disintegrating animal matter; or of combining with the principles of organized substances and destroying their texture. *Lunar Caustic,* a name given to nitrate of silver when cast into sticks for the use of surgeons, etc. *Caustic potash,* the hydrate of potassium. *Caustic soda,* protoxide of sodium.

Caustic, in optics, the name given to the curve to which the rays of light, reflected or refracted by another curve are tangents. Caustics are consequently of two kinds—*catacaustics* and *diacaustics*—the former being caustics by reflection and the latter caustics by refraction.

Cavalier (ka-va-lēr'), a horseman, especially an armed horseman; applied in history to the partisans of Charles I, of England, as opposed to Roundheads, the adherents to the Parliament.

Cav'alry, a body of troops which serve on horseback, one of the three great classes of troops, and a formidable power when properly employed. Its adaptation to speedy movements is a great advantage, which enables a commander to avail himself immediately of a decisive moment, when the enemy exposes a weak point, or when disorder appears in his ranks. It is very serviceable in protecting the wings and center of an army, for escorts, for blockading, for intercepting the supplies of the enemy, for procuring intelligence, for covering a retreat, for foraging, etc. Cavalry are usually armed with sabers, pistols, and carbines. The total of the ten regiments of cavalry in the U. S. regular army is 9,360; each regiment comprising twelve troops, of 78 privates each.

Cav'an, an inland Irish county in Ulster; area 477,399 acres, of which three fourths are

arable. Oats, flax, and potatoes are the chief crops. The principal towns are Cavan, Cootehill, and Belturbet. Pop. 111,917. CAVAN, the county town, 57 mi. n.w. Dublin, has a considerable trade in farm produce. Pop. 2,968.

Cave (or Cavern), an opening of some size in the solid crust of the earth beneath the surface. Caves are principally met with in limestone rocks, sometimes in sandstone, and in volcanic rocks. Some of them have a very grand or picturesque appearance, such as the Mammoth Cave of Kentucky, which encloses an extent of about 40 mi. of subterranean windings, and is celebrated for its great size and subterranean waters. Caves in which the bones of extinct animals are found owe their origin, for the most part, to the action of rainwater on limestone rocks. The deposit contained in them usually consists of clay, sand, and gravel combined. In this are embedded the animal remains, and stones either angular or rounded. Some of the remains found in European caverns belong to animals now found only in the tropical or subtropical regions, and others are the remains of animals now living in more northerly areas; others, again, are the relics of extinct animals. Among the latter class of animals are the cave bear and lion, the mammoth and mastodon, species of rhinoceros, etc. Of others that have only migrated may be mentioned the reindeer, which is no longer found in Southern Europe; and the *Hyæna crocuta,* found in the Gibraltar caves, which now lives in South Africa. The ibex, the chamois, and a species of ground squirrel, are shown to have once lived in the Dordogne, but are now found only on the heights of the Alps and Pyrenees. Thus it is evident that the geographical conditions of the country must have been very different from what they are now. Man's relation to these extinct animals, and his existence at the time these changes took place, are demonstrated by such discoveries as those of human bones and worked flints beneath layers of hyena droppings, as in Wokey's Hole, near Wells, England; mixed up indiscriminately, as in Kent's Hole, near Torquay, with bones of elephant, rhinoceros, hyena, etc.; and by the fact that many bones of the extinct animals are split up, evidently for the sake of the marrow. In the Dordogne and Savigné caves fragments of horn have been found bearing carved, or rather deeply scratched, outline figures of ibex, reindeer, and mammoth.

Cave Men, prehistoric races who lived in caves. That they were at a low state of civilization, though possessed of some artistic faculty, is evidenced by the fact that they were ignorant of the metals, of pottery, and of agriculture, and had no domestic animals.

Cav'endish, tobacco which has been softened and pressed into quadrangular cakes, so called from Thomas Cavendish, the Elizabethan circumnavigator.

Cav'endish, LORD FREDERICK (1836–1882), English statesman, a younger son of the seventh duke of Devonshire. He sat in the House of

Commons as a Liberal for a Yorkshire district from 1865 until the spring of 1882, when he succeeded W. E. Forster as chief secretary of Ireland. On May 6 he reached Dublin, and on that evening he and Mr. Burke, a subordinate government official, were stabbed to death in Phœnix park by "Invincibles."

Cav'endish, HENRY (1731–1800), English physicist and chemist. He devoted himself exclusively to science, and greatly contributed to the progress of chemistry, having discovered the peculiar properties of hydrogen, the composition of water, etc. He also wrote on electricity, and determined the mean density of the earth.

Cavendish (or Candish), THOMAS (1555–1592), an English circumnavigator in the reign of Elizabeth. Having collected three small vessels for the purpose of making a predatory voyage to the Spanish colonies, he sailed from Plymouth in 1586; took and destroyed many vessels, ravaged the coasts of Chile, Peru, and New Spain, and returned by the Cape of Good Hope, having circumnavigated the globe in two years and forty-nine days, the shortest period in which it had been effected. In 1591 he set sail on a similar expedition, during which he died.

Cavendish College, Cambridge, England, founded by the Duke of Devonshire in 1876 for the purpose of giving cheap university education to youths younger than those admitted to other colleges, and leaving earlier.

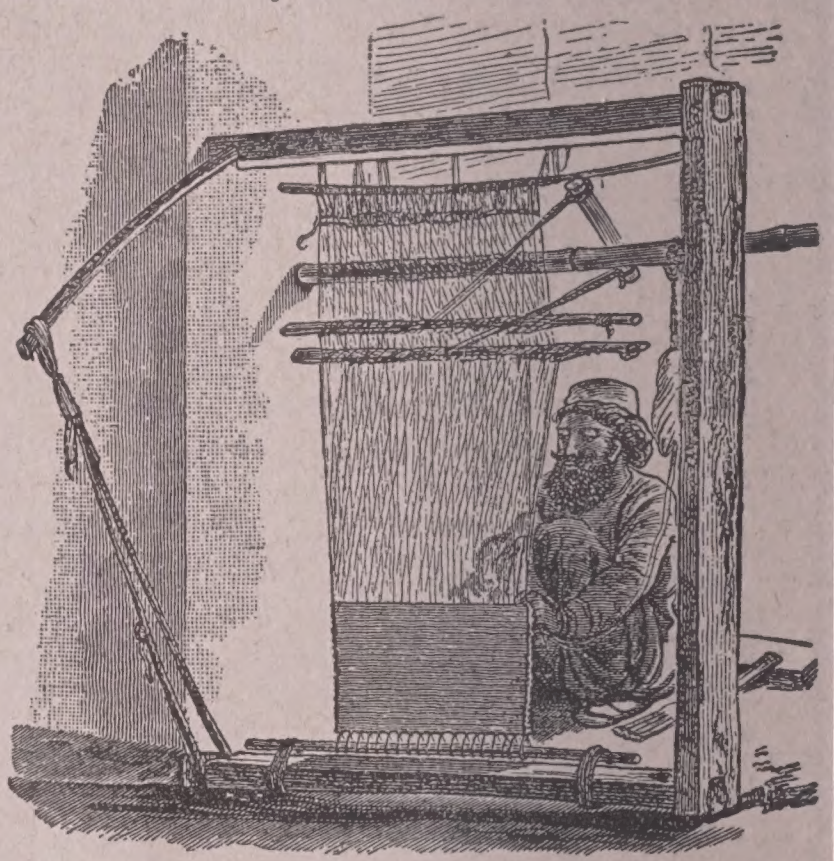
Caviare (kav'i-ār), the roes of certain large fish prepared and salted. The best is made from the roes of the sterlet and sturgeon, caught in the rivers or lakes of Russia.

Cavite (ka-vē'tā), a town in the island of Luzon, one of the Philippines. Its docks and arsenal were once famous. It gives name to a province with a pop. of 57,000. Pop. of town about 7,000.

Cavour (kå-vör'), COUNT CAMILLO BENSO DI (1809–1861), a distinguished Italian statesman. He was educated in the military academy at Turin, and after completing his studies he made a journey to England, where he remained for several years, making himself acquainted with the principles and working of the British constitution, and forming friendships with some of the most distinguished men. He became a member of the Sardinian Chamber of Deputies in 1849, and the following year minister of commerce and agriculture. In 1852 he became premier, and not long afterward took an active part in cementing an alliance with Great Britain and France, and making common cause with these powers against Russia during the Crimean War. In 1860 Garibaldi's expedition to Sicily took place, but toward this and the subsequent movements of the Italian liberator Count Cavour was forced to maintain an apparent coldness. He lived to see the meeting of the first Italian parliament, which decreed Victor Emmanuel king of Italy.

Cawnpore', a town, India, Northwest Provinces. It has manufactures of leather and cotton goods and a large trade. Pop. 188,712. In 1857 the native regiments stationed there mu-

tinied and marched off, placing themselves under the command of the rajah of Bithoor, the notorious Nana Sahib. General Wheeler, the commander of the European forces, defended his position for some days, but was at length induced to surrender on condition of his party being allowed to quit the place uninjured. This was agreed to; but after the Europeans had embarked on the Ganges, they were fired on by the rebels; many were killed, and the remainder conveyed back to the city, where the



Carpet Loom, Cawnpore.

men were massacred, and the women and children placed in confinement. The approach of General Havelock to Cawnpore roused the brutal instincts of the Nana, and he ordered his prisoners to be slaughtered, and their bodies to be thrown into a well. The following day he was obliged, by the progress of Havelock, to retreat to Bithoor. A memorial has since been erected over the scene of his atrocities, and public gardens now surround the well.

Caxamarca (or Cajamarca) (kå-*hå*-mår'kå), a department and town, Peru; area of the department about 14,200 sq. mi.; pop. 213,400. The town is situated about 70 mi. from the Pacific Ocean, 280 n. of Lima. Pop. 18,400. It was the scene of the imprisonment and murder of Atahualpa, the last of the Incas.

Caxias, a town of Brazil, province Maranhão, on the Itapicuru, which is here navigable. Pop. 13,680.

Caxton, WILLIAM (1422–1491), the introducer of the art of printing into Britain. He served an apprenticeship to Robert Large, a London mercer. On the death of his master, Caxton went into business for himself at Bruges. He was afterward appointed governor at Bruges to the London Association of Adventurers. He had translated the popular mediæval romance *Collection of the Histories of Troy*, and in order to multiply copies he learned the newly discovered art of printing. It was printed either at Cologne or Bruges about

1474, and is the earliest specimen of typography in the English language. He translated twenty-one books, mainly romances, from the French, and one from the Dutch, helping materially to fix the literary language of the sixteenth century. He was buried in the church of St. Margaret's, Westminster.

Cayenne (kī-en′), the capital of the colony of French Guiana, is a seaport on an island of the same name at the mouth of the Cayenne River. It is a noted penal settlement, has a large but shallow harbor. Pop. 10,870.

Cayman Islands, three islands situated about 140 mi. n.w. of Jamaica, of which they are dependencies. Grand Cayman, the largest and the only one inhabited, is 20 mi. long and from 7 to 10 broad, and has two towns or villages. The inhabitants, about 2,500 in number, partly descendants of the buccaneers, are chiefly employed in catching turtle. The other two islands are Little Cayman and Cayman Brac. Pop. 400.

Cayu′ga Lake, a lake in the state of New York, 38 mi. long and from 1 to 3½ mi. wide. It is much frequented by pleasure parties.

Ceará (sā-å-rä′), a province on the north coast of Brazil; area 40,255 sq. mi. Among its productions are numerous medicinal plants, gums, balsams, and resins; cotton, coffee, sugar cane, etc., are cultivated. The first Portuguese colony in Ceará was founded in 1610, in the neighborhood of Ceará, the present capital. This town is situated on the coast, and carries on a considerable trade in rubber, coffee, sugar, etc. Pop, of prov. 956,724; of town of Ceará, 33,280.

Cebu (thā-bö′), one of the Philippine Islands, lying between Luzon and Mindanao. Sugar cultivation and the manufacture of abaca are the chief industries. Pop. 320,000. The town of Cebu, on the eastern coast of the island, the oldest Spanish settlement on the Philippines, is a place of considerable trade, and has a cathedral and several churches.

Cecil, the family name of the Salisbury family of English nobility. In addition to the present Marquis of Salisbury the family has produced several noted statesmen of whom Robert Cecil (1563–1612) and William Cecil (1520–1598) were the most celebrated.

Cecil′ia, SAINT, the patron saint of music, who has been falsely regarded as the inventress of the organ, and who is said to have suffered martyrdom A. D. 230, although other dates are given. In the Roman Catholic Church her festival (November 22) is made the occasion of splendid music. Her story forms one of Chaucer's *Canterbury Tales*, and Dryden in his *Alexander's Feast*, and Pope in his *Ode on St. Cecilia's Day*, have sung her praises. Raphael, Domenichino, Dolce, and Mignard, have represented her in celebrated paintings.

Cecro′pia, a genus of beautiful South American trees, of the bread-fruit order. One of these, the trumpet-wood, is remarkable for its hollow stem and branches, the former being made by the Indians into a kind of drum and the latter into wind instruments. The light porous wood is used by the Indians

for procuring fire by friction. The inner bark is fibrous and strong, and used for cordage. This species yields caoutchouc.

Ce′dar, a tree which forms fine woods on the mountains of Syria and Asia Minor. It is an evergreen, grows to a great size, and is remarkable for its durability. Of the famous cedars of Lebanon comparatively few now remain, and the tree does not grow in any other part of Palestine. The most celebrated group is situated not far from the village of Tripoli, at an elevation of about 6,000 ft. above the sea. The circumference of the 12 largest trees here varies from about 18 to 47 ft. Cedar timber was formerly much prized, but in modern times is not regarded as of much value, perhaps from the trees not being of sufficient age. The name is given also to the deodar, which is indeed regarded by many botanists as a mere variety of the cedar of Lebanon, and which produces excellent timber. It is a native of India, and is a large and handsome tree, growing in the Himalayas to the height of 150 ft., with a circumference of 30. It has wide-spreading branches, which droop a little at the extremities. The leaves are tufted or solitary, larger than those of the cedar of Lebanon and very numerous, of a dark bluish green, and covered with a glaucous bloom. The cones are rather larger than those of the Lebanon cedar, and very resinous. The wood is well adapted for building purposes. The Mount Atlas cedar, as its name implies, is a native of the mountains of North Africa. This cedar, though differing in habit and minor features, is regarded by some botanists as specifically identical with the other two. The name is also applied to many trees which have no relation to the true cedar, as the Ber-

Cedars of Lebanon.

muda cedar, used for making pencils, the red cedar, the Honduras, or bastard Barbadoes cedar and the red cedar of Australia.

Cedar Creek, a stream in Shenandoah co., Va., near which General Sheridan converted a defeat of the Federals by the Confederates into a complete victory, October, 1864.

Cedar Lake, a lake in Canada, an expansion of the Saskatchewan before it enters Lake Winnipeg; nearly 30 mi. long, and where widest 25 mi. broad.

Cedar Rapids, Linn co., Ia., on Cedar River, 219 mi. w. of Chicago. Surrounding country agricultural. Railroads: C. & N. W.; B. C. R. & N.; and D. & S. W. It has good water power, a number of mills and manufactories, and several pork-packing establishments. Pop. 1900, 25,656.

Celebes (sel′e-bēz), one of the larger islands of the Indian Archipelago, between Borneo on the west and the Moluccas on the east. Gold is found in all the valleys of the north peninsula, which abounds in sulphur. Copper occurs at various points, and in Macassar, tin also. Diamonds and other precious stones are found. The maritime districts are inhabited by Malays; the Peninsula of Macassar is occupied by Bugis and Macassars. Mandhars dwell in the west of the island, and the mountainous regions in the interior, especially in the north, are inhabited by Alfoories. The inhabitants may be classed into two groups, the Mohammedan semicivilized tribes, and the pagans, who are more or less savages. The capital is Macassar, in the southwest of the island. The trade in trepang is very important, Macassar being the chief staple place for this article of commerce. Celebes was first visited by the Portuguese in 1512, but no factory was established by them there till a few years later. In 1660 Macassar was taken by the Dutch, the southern portion of the island put under Dutch rule, and the Portuguese expelled. In 1683 the northern part likewise fell into their hands. The island was conquered by the British in 1811, but a few years later it was again given up to the Dutch in whose possession it has remained ever since. Pop. est. at 1,154,000.

Cel′ery, an umbelliferous plant indigenous in the temperate parts of Europe. In its native state it has the character of being a poisonous plant, but transplanted to a garden it becomes a wholesome vegetable. It is much cultivated in the U. S., principally two varieties, red and white stalked, and of these many sub-varieties. Celery is commonly blanched by heaping up the soil about the plants.

Celestine, the name of five popes of Rome (422–1296).

Cel′ibacy, the state of being celebate or unmarried; especially applied to the voluntary life of abstinence from marriage followed by many religious devotees and by some orders of clergy, as those of the Catholic Church. The ancient Egyptian priests preserved a rigid chastity; the priestesses of ancient Greece and Rome were pledged to perpetual virginity; and celibacy is the rule with the Buddhist priests of the East. Among Christians the earliest

aspirants to the spiritual perfection supposed to be attainable through celibacy were not ecclesiastics as such, but hermits and anchorites who aimed at superior sanctity.

Cell, a term of various applications. 1, Ecclesiastically it was sometimes applied to a lesser or subordinate religious house, dependent upon a greater. The apartments or private dormitories of monks and nuns are also called *cells.* The term *cell* is applied also to the part of the interior of a temple where the image of a god stood. 2, In electricity, the term is applied to a single jar, bath, or division of a compound vessel, containing a couple of plates, generally copper and zinc, united to their opposites or to each other, usually by a wire. 3, In biology, a *cell* is a microscopically small semi-fluid portion of matter, consisting of a soft mass of living, contractile, jelly-like matter, and a central structure consisting of a small, roundish body, called the *nucleus,* generally more solid than the rest of the cell, and which may have within it a still more minute body, the *nucleŏlus.* The cell substance or protoplasm which surrounds the nucleus is an albuminous substance possessing fundamental vital properties, and believed to be the starting point of all animal and vegetable organisms. The cell wall when present consists of an alteration of the external portion of the cell body, and is not a separate structure.

Cellini (chel-lē′nē), BENVENU′TO (1500–1571), a sculptor, engraver, and goldsmith. At the siege of Rome he killed the constable of Bourbon and the Prince of Orange. He was afterward imprisoned on the charge of having stolen the jewels of the papal crown, and with difficulty escaped execution. He then visited the court of Francis I of France. He afterward returned to Florence, and under the patronage of Cosmo de Medici made a Perseus with the head of Medusa in bronze, which is still an ornament of one of the public squares; also a statue of Christ, in the chapel of the Pitti Palace, besides many excellent dies for coins and medals.

Cellular Tissue, in physiology, a name for what is also called the *areolar tissue.* In botany, the term is applied to the soft substance of plants, composed of elementary vesicles or cells without woody or vascular tissues.

Cell′uloid, an artificial substance extensively used as a substitute for ivory, bone, hard rubber, coral, etc., having a close resemblance to these substances in hardness, elasticity, and texture. It is composed of cellulose or vegetable fibrine reduced by acids to pyroxyline; camphor is then added and the compound molded by heat and pressure to the desired shape. It is used chiefly for buttons, handles for knives, forks, and umbrellas, billiard balls, backs to brushes, piano keys, napkin rings, opera-glass frames, etc. It can be variously colored.

Cell′ulose, the substance of which the permanent cell membranes of plants are always composed. It is closely allied to sugar, dextrin, or gum and starch, and is changed into the latter by heat, sulphuric acid, or caustic potash.

Cel'sius, the name of a Swedish family, several members of which attained celebrity in science and literature. The best known is Anders Celsius (1701–1744). After being appointed professor of astronomy at the University of Upsala he traveled in Germany, England, France, and Italy; and in 1736 he took part in the expedition of Maupertuis and others for the purpose of measuring a degree of the meridian in Lapland. He is best known as the constructor of the Centigrade thermometer.

Celsius Scale, another name for the Centigrade thermometric scale, from that of the inventor, Ander Celsius.

Celts, the earliest Aryan settlers in Europe according to the common theory. They appear to have been driven westward by succeeding waves of Teutons, Slavonians, and others. Herodotus mentions them as mixing with the Iberians who dwelt round the river Ebro, in Spain. At the beginning of the historic period they were the predominant race in Britain, Ireland, France, Belgium, Switzerland, North Italy, Spain, and elsewhere. The Romans called them generally Galli, that is, Gauls or Gael. They appear to have reached the zenith of their power in the second and third centuries B. C. Some tribes of them, overrunning Greece, settled in a part of Asia Minor, to which the name of Galatia was given. They finally went down before the resistless power of Rome, and either became absorbed with the conquering races or were cooped up in the extreme northwest of Europe. At an early date the Celts divided into two great branches, speaking dialects widely differing from each other, but doubtless belonging to the same stock. One of these branches is the Gadhelic or Gaelic, represented by the Highlanders of Scotland, the Celtic Irish, and the Manx; the other is the Cymric, represented by the Welsh, the inhabitants of Cornwall, and those of Brittany. The sun was the principal object of worship among the Celts. All the old Celts seem to have possessed a kind of literary order called Bards.

Celts, the name given to certain prehistoric weapons or other implements of stone or bronze which have been found over nearly the whole surface of the earth. Stone celts are found in the form of hatchets, adzes, chisels, etc. They vary in size from 1 in. to 2 ft. in length. The breadth is usually about $\frac{1}{2}$ or $\frac{1}{3}$ of the length. The materials of which they are made are flint, chert, clay slate, porphyry, various kinds of greenstone, and of metamorphic rocks, and, in short, any very hard and durable stone. Bronze celts belong to a later period than stone ones, and are not so numerous. Some stone celts, however, have been found along with bronze celts in such a manner as to show that stone celts were still used when the method of working bronze had been discovered.

Cementa'tion, the conversion of iron into steel by heating the iron in a mass of ground charcoal, and thus causing it to absorb a certain quantity of the charcoal.

Cements', the general name of glutinous or other substances capable of uniting bodies in close cohesion. In building the name is given to a stronger kind of mortar than that which is ordinarily used, consisting of those hydraulic limes which contain silica and therefore set quickly. Cements are variously composed, according to the nature of the surfaces to which they are applied and their exposure to heat and moisture. *Hydraulic* or *water cements* harden under water and consolidate almost immediately on being mixed. Of this kind are the Roman and Portland cements.

Portland cement is made by two processes, the wet and dry. In the wet process the clay and limestone are mixed with a large quantity of water in a mechanical mixer. When it has been thoroughly mixed, it is emptied into large reservoirs and allowed to settle. In time the heavy material or raw cement settles to the bottom. The water is drawn off and the raw cement is left to dry in the air until it is a thick paste. It is then placed in the dry-room until all the moisture is evaporated, when it is burned in a suitable kiln. The kiln is brought to a white heat and the cement is kept in it until it is almost glass, or until it is nearly vitrified. It is taken from the kiln in the form of clinkers which are greenish in color. These clinkers are ground to a fine powder between crushing rolls and packed in bags or barrels ready for shipment. In the dry process the clay and limestone are first separately dried in a dry-kiln until all the moisture is expelled. The clay and carbonate of lime are then mixed and crushed and the powdered mixture is tempered with water to a stiff paste in a brick-making machine and molded into bricks. The mixture is kept warm during the process by steam coils, and the water used for tempering is made strongly alkaline by adding calcined soda or newly burned slaked lime. The bricks are then burned to the cement clinker in kilns, and finally ground into powder. A natural cement is made from limestone which has the proper ingredients, but it is not as good as the manufactured cement because the proportions of silica, alumina, and iron do not run evenly in the limestone. Cement increases in strength with age and a good cement will attain half of its ultimate strength and hardness within two months. It has been estimated that Portland cement made into a stiff paste without sand is able to stand a tensile strain of 400 lbs. to the sectional area of $1\frac{1}{2}$ sq. in. several days after the test piece is molded, the sample having been kept under water for six days.

Cenci (chen'chē), BEATRICE, called the *beautiful parricide*, the daughter of Francesco Cenci, a noble and wealthy Roman (1527–98), who, according to the common story, after his second marriage, behaved toward the children of his first marriage in the most shocking manner, procured the assassination of two of his sons, on their return from Spain, and debauched his youngest daughter Beatrice. She failed in an appeal for protection to the pope, and planned and executed the murder of her

father. She was beheaded 1599 and the Cenci estates confiscated. She is the alleged subject of an admired painting by Guido, and is the heroine of one of Shelley's most powerful plays.

Cenis, (sė-nē′) MOUNT, a mountain belonging to the Graian Alps, between Savoy and Piedmont, 11,755 ft. high. It is famous for the winding road constructed by Napoleon I which leads over it from France to Italy, and for an immense railway tunnel, which, after nearly fourteen years' labor, was finished in 1871. The total length of the tunnel is nearly 8 mi. The total cost amounted to $13,000,000, which was borne partly by the French and Italian governments and partly by the Northern Railway Company of Italy.

Cen′ser, a vase or pan in which incense is burned; a vessel for burning and wafting incense. Among the ancient Jews the censer was used to offer perfumes in sacrifices. Censers, called also thuribles, are still used in the Roman Catholic Church at mass, vespers, and other offices, as well as in some Anglican and other churches. They are of various forms. In Shakespeare's time the term was applied to a bottle perforated and ornamented at the top, used for sprinkling perfume, or to a pan for burning any odoriferous substance.

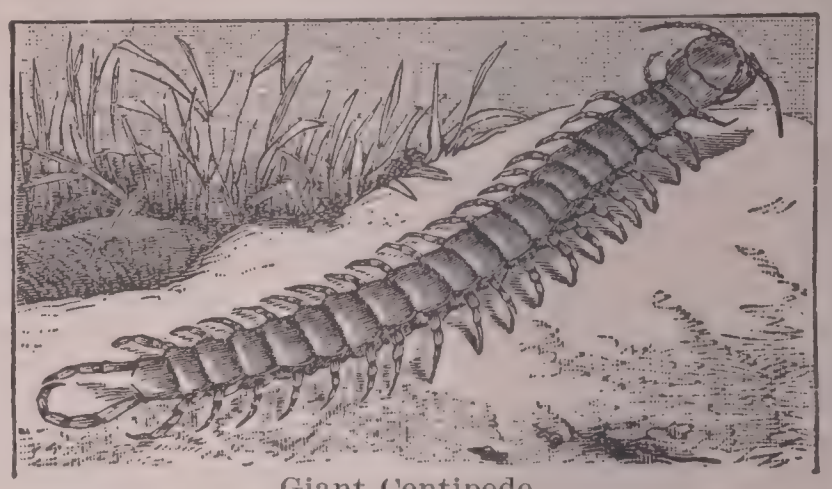
Cen′sors, two officers in ancient Rome who held office for eighteen months, and whose business was to draw up a register of the citizens and the amount of their property, for the purpose of taxation; to keep watch over the morals of the citizens, for which purpose they had power to censure vice and immorality by inflicting a public mark of ignominy on the offender; and to superintend the finance administration and the keeping up of public buildings. The office was the highest in the state next to the dictatorship, and was invested with a kind of sacred character. The term is now applied to an officer empowered to examine books before publication.

Cen′sus, with the Romans a registered statement of the particulars of a person's property for taxation purposes. In modern times a census is an enumeration of the inhabitants of a country, accompanied by any other information that may be deemed useful. In most civilized countries such enumerations now take place at fixed intervals. In the U. S., England, Switzerland, Sweden, and Norway, Holland, Belgium, and Portugal, a census is taken every ten years.

Cent (Centime), the name of a small coin in various countries, so called as being equal to a hundredth part of some other coin. In the U. S. and in Canada, the cent is the hundredth part of a dollar. In France the *centime* is the hundredth part of a franc. Similar coins are the *centavo* of Chile, and the *centesimo* of Italy and Peru. Cents or centimes, and their equivalents, are written simply as decimals of the unit of value.

Cen′taurs, in Greek mythology, fabulous beings represented as half man, half horse. The earliest notices of them, however, merely represent them as a race of wild, savage men inhabiting the mountains and forests of Thessaly.

Cen′tipede, a term applied to various insect-like creatures having many feet, and a body consisting of numerous similar rings or segments. The common centipede, found in the



Giant Centipede.

U. S., is quite harmless, but those of tropical countries inflict severe and often dangerous bites. They sometimes grow to a foot in length.

Central America. See *America.*

Centralia, Marion co., Ill., 62 mi. e. of St. Louis. Railroads: I. C.; J. L. & S. L.; C. & C.; and L. E. & S. L. Industries: railroad shops, and three flouring mills. Surrounding country mineral (coal mines). The town was first settled in 1850 and became a city in 1859. Pop. 1900, 6,721.

Central Provinces, an extensive British territory in India. They became a separate administration in 1861, and are under the authority of a chief commissioner. Their total area is 115,936 sq. mi., of which 86,501 sq. mi. are British territory, and 29,435 the territory of native protected states, fifteen in number. Pop. 12,944,805.

Center Board, a sort of movable keel used in American yachts, and capable of being raised and lowered in a well extending longitudinally amidships. It tends to prevent leeway and gives the vessel greater stability when under a press of canvas.

Center of Gravity, that point of a body through which the line of the resultant of the weights of all the particles composing the body always passes, whatever be the position of the body.

Center of Gyration, the point at which, if the whole mass of a revolving body were collected, the rotatory effect would remain unaltered.

Center of Oscillation, that point of a body suspended by an axis, at which, if all the matter were concentrated, the oscillations would be performed in the same time.

Center of Pressure, that point of a body at which the whole amount of pressure may be applied with the same effect as it would produce if distributed; specifically, in hydrostatics, that point in the side of a vessel containing a liquid, to which, if a force were applied equal to the total pressure and in the opposite direction, it would exactly balance the effort of the total pressure.

Centrif′ugal and Centrip′etal, terms ap-

plied to two kinds of inflorescence, the former being that in which the terminal or central flower is the first to expand, as in a true cyme (examples, elder and valerian), the latter being that kind in which the lower or outer flower is the first to expand, as in spikes, racemes, umbels, and corymbs. The laburnum, hemlock, and daisy are examples.

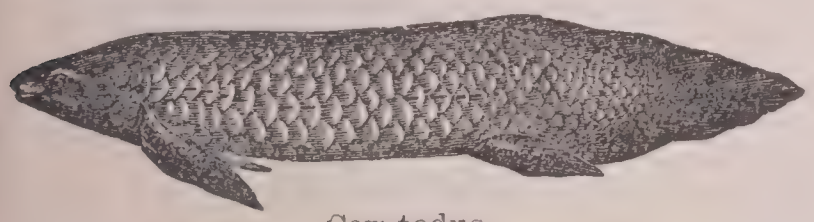
Century Plant, a popular name of the American aloe.

Cephalo′nia, an island of Greece, the largest of the Ionian Islands; area 348 sq. mi.; pop. 80,543. The coast line is very irregular and the surface is mountainous. There is rather a deficiency of water on the island. The principal towns are Argostoli (9,000 inhabitants) and Lixuri (6,000). The chief exports are currants, oil, and grain; wine, cheese, etc., are also exported. Earthquakes are not infrequent. One of the most destructive was that of the year 1867.

Ceram′, an island in the Moluccas, lying west of New Guinea; area about 7,000 sq. mi.; pop. est. at 200,000. The vegetation is luxuriant, the sago-palm supplying the chief food of the inhabitants as well as an article of trade. The inhabitants of the coast are of Malay origin, the interior being peopled by Alfoories. It is under the Dutch.

Ceram′ic Art, that department of plastic art which comprises all objects made of baked clay, as vases, cups, urns, bassi-rilievi, statuettes, etc., and including all the varieties of earthenware and porcelain which can be regarded as works of art. See *Pottery*.

Cerat′odus, a genus of fishes belonging to the Dipnoi or lung fishes. It is the barramunda or native salmon of the Australian rivers, measures from 3 to 6 ft. in length, and



Ceratodus.

forms an interesting connecting link between the oldest surviving group of fishes and the lowest air breathing animals.

Cer′berus, in classical mythology, the dog monster of Hades, variously described as having a hundred, fifty, and three heads, with a serpent's tail, and a mane consisting of the heads of various snakes. He was subdued by Hercules.

Ce′reals, a term derived from Ceres, the goddess of corn, though sometimes extended to leguminous plants, as beans, lentils, etc., is more usually and properly confined to the Gramineæ, as wheat, barley, rye, oats, and other grasses, cultivated for the sake of their seed as food.

Ceres (cē′rēz), a Roman goddess. She was the daughter of Kronos and Rhea, and the mother of Proserpine and Bacchus. She was the goddess of the earth in its capacity of bringing forth fruits, especially watching over the growth of grain and other plants. The

Romans celebrated in her honor the festival of the Cerealia. Ceres was always represented in full attire, her attributes being ears of corn and poppies, and her sacrifices consisted of pigs and cows. Also a planet discovered by M. Piazzi at Palermo, in Sicily, in 1801. It was the first discovered of the asteroids. Its size is less than that of the moon.

Cerro de Pasco, a town of Peru, capital of the department of Junin, 14,275 ft. above the level of the sea. The town came into existence in 1630, in consequence of the discovery of veins of silver there. The climate is trying and the whole place uninviting, though it still contains the most productive of the Peruvian mines. Pop. about 14,000.

Certaldo (Cher-tål′do), a small town of North Italy, 15 mi. s.w. from Florence. It is the birthplace, was long the home, and now contains the ashes of Boccaccio, and many interesting relics.

Cervantes Saavedra (thor-vån′tes-så-å-vā′-*drå*), Miguel de (1547–1616), author of *Don Quixote*, b. at Alcalá de Henares, and removed thence to Madrid at the age of seven. He commenced writing verses at an early age, and his pastoral *Filena* attracted the notice of Cardinal Acquaviva, whom he accompanied to Italy as page. In 1570 he served under Colonna in the war against the Turks and African corsairs, and in the battle of Lepanto (1571) he lost the use of his left hand. After this he joined the troops at Naples, in the service of the Spanish king, winning the highest reputation as a soldier. In 1575, while returning to his country, he was taken by the corsair Arnaut Mami, and sold in Algiers as a slave — a condition in which he remained for seven years, displaying great fortitude. In 1580 his friends and relations at length ransomed him, and, rejoining his old regiment, he fought in the naval battle and subsequent storming of Terceira. In 1583, however, he retired from service, and recommenced his literary work, publishing in 1584 his pastoral *Galatea*. In the same year he married, and lived for a long time by writing for the stage, to which he contributed between twenty and thirty plays, of which two only have survived. From 1588 to 1599 he lived retired at Seville, where he held a small office. He did not appear again as an author till 1605, when he produced the first part of *Don Quixote*, a work having, as its immediate aim, the satirical treatment of the novels of chivalry then popular, but embodying at the same time human types of cosmopolitan interest, and having a profounder bearing upon life than its express object covered. In 1613 his twelve *Exemplary Novels* (his best work after *Don Quixote*), in 1614 his *Journey to Parnassus*, and in 1615 eight new dramas, with intermezzos, were published.

Cervin. See *Matterhorn*.

Cesnola, Luigi Palma, Count di, b. in Italy, June 29, 1832; served in the U. S. army during the Civil War, and was U. S. consul in Cyprus from 1865 to 1875. He discovered and purchased many interesting Cypriote antiquities,

which are now in the Metropolitan museum at New York, of which General Cesnola is secretary and director.

Cestus, in classical mythology, a girdle worn by Aphrodītē, or Venus, endowed with the power of exciting love toward the wearer.

Cestus, a leathern thong or bandage, often covered with knots and loaded with lead and iron, anciently worn by Roman pugilists to increase the force of the blow.

Ceta′cea, an order of marine animals, surpassing in size all others in existence. They are true mammals, since they suckle their young, have warm blood, and respire by means of lungs, for which purpose they come to the surface of the water to take in fresh supplies of air. The body is fishlike in form, but ends in a bilobate tail, which is placed horizontally, not, as in the fishes, vertically. The posterior limbs are wanting, and the anterior are converted into broad paddles or flippers, consisting of a continuous sheath of the thick integument, within which are present representatives of all the bones usually found in the fore limb of mammals. The fishlike aspect is further increased by the presence of a dorsal fin, but this is a simple fold of integument and does not contain bony spines. The right whale and its allies have no teeth in the adult state, their place being taken by the triangular plates of *baleen* or whalebone which are developed on transverse ridges of the palate, but the fœtal whales possess minute teeth, which are very soon lost. The nostrils open directly upward on the top of the head, and are closed by valvular folds of integument which are under the control of the animal. When it comes to the surface to breathe it expels the air violently, and the vapor it contains becomes condensed into a cloud, which resembles a column of water and spray. The blood-vessels in these animals break up into extensive plexuses or networks, in which a large amount of oxygenated blood is delayed, and they are thus enabled to remain a considerable time under water. Injury to these dilated vessels leads to profuse hemorrhage, and hence the whale is killed by the comparatively trifling wound of the harpoon. The Cetacea are commonly divided into five families: 1, *Balænidæ*, or whalebone whales, divided into two sections: smooth whales, with smooth skin and no dorsal fin, and furrowed whales, with furrowed skin and a dorsal fin; 2, *Physeteridæ*, *Catodontidæ*, sperm whales or cachalots, the palates of which have no baleen plates, and which are furnished with teeth, developed in the lower jaw only; 3, *Delphinidæ*, a family possessing teeth in both jaws, and including the dolphins, porpoises, and narwhal; 4, *Rhynchoceti,* a family allied to the sperm whales, but having only a pair or two pairs of teeth in the lower jaw, a pointed snout or beak, a single blow hole, etc.; 5, *Zeuglodontidæ*, an extinct family, distinguished from all the tooth-bearing whales by the possession of molar teeth implanted by two distinct fangs, etc. The last family is exclusively confined to the Eocene, Miocene, and Pliocene periods. The *Sirenia*, or manatees and dugongs, have

sometimes been classified among the Cetacea, but they must be regarded as forming a separate order.

Cetewayo (kech-wā′ō), a Kaffir chief or king, son of Panda, king of the Zulus. Disturbances as to the succession having arisen in Zululand, Mr. Theophilus Shepstone, representative of the Natal government, secured the recognition of Cetewayo as king in 1873. The latter, however, in spite of the obligations into which he had entered, proved a tyrannical ruler, and maintained a large army. A dispute which had arisen regarding lands on the frontier was settled by arbitration in favor of the Zulus; but on the refusal of Cetewayo to comply with the conditions imposed war was declared against him by the British, and the king made prisoner soon after the battle of Ulundi (July, 1879). In 1882 he was conditionally restored to part of his dominions. In the following year he was driven from power by the chief Usibepu, and remained under the protection of the British until his death in 1884.

Cette (set), a fortified seaport, France, dep. Hérault. After Marseilles, Cette is the principal trading port in the south of France, and it is much resorted to as a watering place. Pop. 35,517.

Cevennes (sė-venz′), a chain of mountains in the southeast of France, in the widest sense extending from the Pyrenees in the southwest to the Vosges in the northeast, the Côte d'Or being sometimes considered as a part of it, sometimes as a part of the Vosges system. The length of the chain, exclusive of the Côte d'Or, is about 330 mi., the average height not more than 3,000 ft. The highest peak is Mezenc, 5,753 ft.

Ceylon (si-lon′), an island belonging to Great Britain in the Indian Ocean. Area 25,333 sq. mi.; pop. 3,012,224. In respect of climate, it is found that where the jungle has been cleared away, and the land drained and cultivated, the country is perfectly healthy; but where low wooded tracts and flat marshy lands abound it is malarial and insalubrious.

Most of the animals found on the opposite continent are native to this island, excepting the tiger. Elephants are numerous, especially in the north and east provinces, and licenses for their capture and exportation are issued by government. The wild life of the island includes bears, buffaloes, leopards, hyenas, jackals, monkeys, wild hogs, several species of deer, porcupines, armadilloes, mungooses, the pangolin or scaly ant eater, the loris, or Ceylon sloth, flying foxes, crocodiles, numerous snakes, partly poisonous, and a great variety of birds of brilliant plumage. Its most valuable products are coffee, tea, rice, cinnamon (which is found almost exclusively in the southwest), and the cocoanut and Palmyra palm. The south parts of the island produce the jaggery palm, the sap of which yields a coarse sugar, and its fruit a substitute for rice flour. The taliput palm, the jack, and bread-fruit trees, are abundant and the Ceylon areca nut, celebrated for its superior qualities, is exported in large quantities. Excellent tobacco is raised in the north

district. The island abounds with timber of various descriptions, including ebony, satin, rose, sapan, iron, jack, and other beautiful woods adapted for cabinet work. Attention has been directed latterly to the cultivation of cinchona, cacao, and silk. The chief mineral products are iron, plumbago or graphite, and a variety of gems, including sapphires, rubies, etc. The pearl fisheries of Ceylon are famous, but, for some unexplained reason, sometimes fail for years, there having been none between 1837 and 1854, or between 1863 and 1874. The exports comprise coffee, tea, plumbago, areca nuts, cocoanut oil, fiber, and kernels (copra), cinnamon, cinchona, cacao, etc. The principal articles of import are manufactured goods chiefly from Great Britain, as cotton manufactures, apparel and haberdashery, iron and steel manufactures, machinery, etc.; from other countries dried fish, rice, wheat, sugar, tea, cowries, etc. The island is provided with a system of excellent roads, and the railways have a length of about 200 mi.

Ceylon is one of the British colonies, the government being conducted by a governor and two councils, executive and legislative, of both of which the governor is president. The island is divided into eight provinces.

The present population of Ceylon is composed of Singhalese or Cingalese, who are the Ceylonese proper, Tamils (from India), Moormen or Moors, Malays, Veddahs, a small proportion of Europeans and their descendants, and negroes. The Singhalese are in stature rather below the middle size; their limbs slender, but well shaped, eyes dark, finely-cut features, hair long, smooth, and black, turned up and fixed with a tortoise-shell comb on the top of the head; color varying from brown to black, or rather from the lightest to the darkest tints of bronze. The general population of the island was decreasing for several centuries. It is now, however, on the increase, and latterly this increase has been rapid.

The Singhalese possess a native chronicle, the *Mahawanso*, which records the history of the island from 543 B.C. onward, under a long series of kings reigning most frequently at the ancient capital Anuradhapura, the earliest of these being leader of an invading host from India. Buddhism was introduced 307 B.C. These incomers brought with them the civilization of India; great part of the country became covered with towns and villages having temples and dagobas, agriculture flourished, and the aborigines (represented by the Veddahs of to-day) were compelled to construct artificial lakes, tanks, and other irrigation works. The capital, Anuradhapura, as its ruins still testify, was a place of great extent and magnificence. The island was not known to Europeans till the time of Alexander the Great, and their knowledge of it was long vague and meager. By the time of Pliny it had become better known, and he gained much additional information from Ceylonese envoys that were sent to Rome. In the Middle Ages the country was much troubled by invasions of the Malabars, and for a time it was

even tributary to China. It had greatly declined in prosperity when visited by Europeans, the first of whom was Marco Polo in the end of the thirteenth century. At its most flourishing period its population was probably ten times as great as at present. Little, however, was known in Europe regarding the island until 1505, when the Portuguese established a regular intercourse with it, and latterly made themselves masters of it. When they arrived the Malabars were in possession of the north, the Moors or Arabs held all the seaports, the rest was under petty kings and chiefs. The Portuguese, who were cruel and oppressive rulers, were subsequently expelled by the Dutch in 1658, after a twenty years' struggle. The Dutch in turn were driven from the island by the British in 1796, though a part of the island remained independent under native princes. The king of Kandy, nominally the sovereign of the island, was deposed in 1815 on account of his cruelties, and the island was then finally annexed by Britain, though a rebellion had to be put down in 1817. The principal towns are Colombo (the capital), Kandy, Point de Galle, Jaffna, and Trincomalee.

Chablis (shå-blē), a town, France, dep. Yonne, famous for white wines of a beautifully clear and limpid color, good body, and extreme delicacy of flavor. Pop. 2,185.

Chadbourne, Paul Ansel (1823–1883), American educator, b. in Maine. He graduated in 1848 at Williams College, of which he became president in 1872, succeeding Mark Hopkins.

Chaff Cutter, an agricultural instrument for chopping hay or straw into lengths to be used as food for animals. The economical advantage of the chaff cutter does not depend on its rendering the chopped food more digestible; but on permitting it to be more thoroughly mixed with the more nutritive and palatable food, and preventing the animal from rejecting any part of it. By the use of the chaff cutter animals are therefore induced to consume a much larger proportion of fodder with their food, which not only improves the condition of the stock, but saves time in feeding, thus allowing the animal more time to repose.

Chaff'inch, a lively and handsome bird of the finch family, very common in Britain, where its haunts are chiefly gardens and shrubberies, hedgerows, plantations, etc. The male is 6 or 7 in. in length, and is very agreeably colored, having a chestnut back, reddish-pink breast and throat, and a yellowish-white bar on the wings. The food consists of seeds and of insects and their larvæ. The nest, which is generally placed in the fork of a tree, is an elegant structure usually covered with moss and lichens.

Chagos (chā'gōs) **Islands,** a group of islands in the Indian Ocean belonging to Britain. They are scantily peopled, and the chief product is cocoanut oil,

Chagres (chä'gres), a seaport of Colombia, on the north coast of the Isthmus of Panama, at the mouth of the Chagres River, formerly

of some importance. It is destined to be one of the outlets of the Panama canal when that long-delayed project is completed.

Chain, in surveying, is a measure consisting of 100 links, each 7.92 in. in length and having a total length of 4 rods, or 66 ft. It is sometimes called Gunter's chain, from its inventor.

Chain Making.—For the manufacture of a chain only the softest and best iron obtainable is selected because it is necessary that it weld readily. The iron is brought to the factory in coils about 100 ft. each for the smaller chains and in bars about 18 ft. long for larger chains. The coiling is done when the iron is cold thus proving the quality of it. The coils are taken to a powerful steam shear where each small coil is cut through on one side and the pieces allowed to fall into a keg. These pieces now look like a link open at one end and as the cut was made at an angle, when the two ends of the link are brought together they will lap over each other. These open links are put in a furnace and heated to a white heat. Each link is then taken out and hooked through a link which has been finished and which forms a part of the chain which is being made. The open ends of the link are then firmly welded with a hammer. When a large size chain is being made the bars of iron are cut into pieces just long enough for the desired length because it is impossible to coil the larger sizes of iron into spirals. These pieces are heated and bent into a U shape and then welded. The ends of the links being crossed over each other about an inch to make a stronger weld. In the cheaper grades of machine-made chains the welding is done under a steam hammer. When chains are made for use over sprocket wheels the inside diameter of the links must be of a certain size. The chains that require the greatest skill and care are the heavy chains used on dredges and steam shovels. Before a chain is shipped it is tested by being put in a pulling machine. A machine has recently been invented for manufacturing chains and it is now possible to make excellent chains from a cheaper grade of iron on account of doing away with the weld. The machine consists of four rolls which are so arranged that they work all at the same time on the bar of iron which is put between them. Small curves on the rolls, which look like chain links, are steel dies or cutters highly tempered and hardened. The heated iron is made to pass in between the four rolls of the machine which revolve rapidly. The guides on the four edges of the rolls operate simultaneously on the four flanges of the iron bar pressing it into the form of a chain. This leaves small pins of iron between the links and it is necessary to remove these by means of cutters and molds. Then the chain is heated again and run through the rolls which straighten out the links and give a smooth, finished appearance to the chain. This machine can turn out about one yard of chain per second.

Chain Pump, a pump consisting in principle of an endless chain equipped with a number of valves or buckets moving round two wheels, one above and one below. The chain in its ascent passes through a tube closely fitting the valves or buckets, the water being discharged either from the top of the tube or from an orifice in it.

Chain Shot, two cannon balls connected by a chain, which, when discharged, revolve upon their shorter axis, and mow down masts, rigging, etc.

Chalce'don (kal-sē'don), a Greek city of ancient Bithynia, opposite Constantinople, at the entrance of the Black Sea, about 2 mi. s. of the modern Scutari. It was a flourishing town when it came into possession of the Romans, under the testament of Nicomedes, B.C. 74; as included in the kingdom of Bithynia. It was finally destroyed by the Turks, about 1075.

Chalced'ony (kal-sed'o-ni), a mineral, a variety of quartz, called also white agate, resembling milk diluted with water, semi-transparent or translucent, and more or less clouded with circles and spots. It is found usually in cavities of rocks uncrystallized, in veins, botryoidal masses, etc., and is used in jewelry. There are several varieties, such as the common chalcedony, chrysoprase, sard, and sardonyx.

Chalcis (kal'sis), a Greek town, separated by the narrow strait of Euripus from the Bœotian coast, on the mainland of Greece. Chalcis early became one of the greatest of the Ionic cities, carrying on an extensive commerce, and planting numerous colonies in Syria, Macedonia, Italy, Sicily, and the islands of the Ægean Sea. It was subsequently a place of importance under the Romans. There is still a town on the site, consisting of an inner walled town and an outer suburb, and said to be one of the prettiest and most attractive of Greek provincial towns. A bridge, so constructed as to let vessels pass through, connects it with the mainland. Pop. 12,250.

Chaldæa, in ancient geography, the southerly part of Babylonia, or in a wider sense, corresponding to Babylonia itself. The name Chaldæans was especially applied latterly to a portion of the Babylonian Magi, who were devoted to the pursuit of astronomy and magical science.

Chaldee Language, a name often given to the Aramean language, one of the principal varieties of the ancient Semitic. Chaldee literature is usually arranged in two divisions: the Biblical Chaldee, or those portions of the Old Testament which are written in Chaldee, namely, Daniel from 2:4 to 7:28; Ezra 4:8 to 6:18; and 7:12-26; and Jeremiah 10:11; and the Chaldee of the Targums, and other later Jewish writings.

Chaldeur Bay (sha-lör'), an inlet of the Gulf of St. Lawrence, between Quebec and New Brunswick. The French fleet was here defeated by the British in 1760.

Chalk (chạk), a well-known earthy limestone, of an opaque white color, soft and admitting no polish. It is an impure carbonate

of lime, and is used as an absorbent and antacid, and for making marks for various purposes, as on the blackboard in schools, and by artisans and others. *Black chalk* is a soft variety of argillaceous slate. *Brown chalk*, a familiar name for umber. *Red chalk*, another name for ruddle. *French chalk*, steatite or soapstone, a soft magnesian mineral. *Drawing chalks* were originally restricted in colors to white, black, and red, but now chalks of every color are used, and are known by the name of *crayons*. In geology chalk is the rock which forms the higher part of a series or group of strata, comprising rocks of different kinds, termed the cretaceous system.

Challemel-Lacour, Paul Armand, French statesman, b. May 19, 1827; became a college professor and was banished by Napoleon III. After the downfall of the empire he was made Prefect of the Rhone. He was elected to the Chamber as a Radical in 1872; became a senator in 1876. In 1879 he was sent as ambassador to Switzerland, and from June, 1880, until February, 1882, represented France in London. In 1883 he became minister of foreign affairs. He founded, and was chief editor of, the *République Française*, an influential journal of Paris.

Chal'lenge, to jurors, is an objection either to the whole panel or array, that is, the whole body of jurors returned, or to the *polls*, that is, to the jurors individually: aud it is either *peremptory*, that is, without assigning any reason, or *for cause* assigned. See *Jury*.

Challenger Expedition, a circumnavigating scientific exploration of the open sea sent out by the British government in 1872–76—earlier expeditions being those of the *Lightning* (1868) and *Porcupine* (1870). In 1872 the *Challenger*, a corvette of 2,306 tons, was completely fitted out and furnished with every scientific appliance for examining the sea from surface to bottom—natural history work room, chemical laboratory, aquarium, etc. The ship was given in charge to a naval surveying staff under Captain Nares; and to a scientific staff, with Professor (afterward Sir) Wyville Thomson at their head, for the purpose of sounding the depths, mapping the basins, and determining the physical and biological conditions of the Atlantic, the Southern, and the Pacific Oceans.

With this new commission the *Challenger* weighed anchor at Sheerness Dec. 7, 1872, and on the evening of May 24, 1876, she dropped anchor at Spithead, having in these three and a half years cruised over 68,900 nautical miles, and made investigations at 362 stations, at each of which were determined the depth of channel; the bottom, surface, and intermediate temperatures, currents, and fauna; and the atmospheric and meteorological conditions. The route was by Madeira, the Canaries, the West Indies, Nova Scotia, Bermudas, Azores, Cape Verd, Fernando Noronha, Bahia, Tristan d' Acunha, Cape of Good Hope, Kerguelen, Melbourne, the Chinese Sea, Hong Kong, Japan, Valparaiso, Magellan's Strait, Montevideo, Vigo, and Portsmouth. Between the Admiralty Isles and Japan the *Challenger* made her deepest sounding, on March 23, 1875, 4,575 fathoms.

Chalmers, a noted Scotch family, famous as producing 1, Alexander C. (1759–1834), author of several useful works including a general *Biographical Dictionary*; 2, George C. (1742–1825), a famous Scotch anlynarian; and 3, Thomas C. (1780–1847), a noted Scotch preacher and author.

Chalons-sur-Marne (shä-lōṇ-sûr-mårn), a city of France, capital of the department Marne (Champagne). There are manufactures of woolen and cotton goods; also cotton mills, tanneries, etc. In 451 Attila was defeated before the walls of Châlons, and from the tenth century it flourished as an independent state under counts-bishops, having about 60,000 inhabitants. After being united to the French crown, in 1360, it declined. A celebrated camp was established by Napoleon III about 18 mi. from Châlons for the purpose of training the French troops, still to some extent employed. Pop. 25,863.

Chalybeate Waters (ka-lib'ē-āt), waters holding iron in solution, either as a carbonate or as a sulphate with or without other salts. All waters containing iron are distinguished by their styptic, inky taste, and by giving a more or less deep color with an infusion of tea or of nutgalls.

Chalybite (kal'i-bīt), an ore of iron, a native anhydrous-metacarbonate, existing abundantly under the name of *Spathic* or *Sparry Ore*, or *Siderite*. A siliceous or argillaceous variety called clay ironstone, occurring in the coal measures, is one of the most abundant and valuable ores of iron. Combined with carbonaceous matter it forms the black-band ironstone.

Chamalari (Cham'alhari), a peak of the Himalaya Mountains, at the western extremity of the boundary line between Bhutan and Thibet. Height 23,929 ft.

Chamber, a word used in many countries to designate a branch of government whose members assemble in a common apartment, as the *chamber* of deputies in France, or applied to bodies of various kinds meeting for various purposes. The *imperial chamber* of the old German Empire was a court established at Wetzlar, near the Rhine, by Maximilian I in 1495, to adjust the disputes between the different independent members of the German Empire, and also such as arose between them and the emperor. *Chambers of Commerce* are associations of the mercantile men of towns for the purpose of protecting and furthering the interest of the commercial community.

Chamberlain, Joseph, English statesman, b. in London in 1836, and educated at London University school. He became a member of a firm of screw makers at Birmingham, but gave up active connection with the business in 1874. He early became prominent in Birmingham both in connection with civic and political affairs, being an advanced radical and an able speaker, was chairman of the school board, and thrice in succession mayor of the city (1874–76). In 1876 he entered Parliament as a representative of Birmingham, and at the

cultural. Railroads: Chicago div. of Central railroad, and the Indianapolis, Bloomington & Western. The Illinois State Industrial University is located here. Principal industries: wagon and furniture manufactories. Pop. 1900, 9,098.

Champ-de-Mars (shäṇ-dė-märs), that is, Field of Mars, an extensive piece of ground in Paris, used as a place of military exercise. It was here that Louis XVI swore to defend the new constitution in 1790, and it was the site of the exhibitions of 1867 and 1878.

Champlain (sham-plān) LAKE, a lake chiefly in the U. S. between the states of New York and Vermont, but having the north end of it in Canada; area about 600 sq. mi. It is connected by canal with the Hudson River, and has for outlet the river Richelieu, or Sorel, flowing north to the St. Lawrence. Its scenery is beautiful, and attracts many visitors.

Champlain (shäṇ-plaṇ), SAMUEL (1570–1635), a French naval officer and maritime explorer. His exploits in the maritime war against Spain in 1595 attracted the attention of Henry IV, who commissioned him in 1603 to found establishments in North America. After three voyages for that purpose, in the last of which he founded Quebec, he was in 1620 appointed governor of Canada.

Champollion (shän-pol-yōn), JEAN FRANCOIS (1790–1832), French scholar, celebrated for his discoveries in the department of Egyptian hieroglyphics, b. at Figeac, department of Lot, France. He went to Paris, where, with the aid of the trilingual inscription of the Rosetta Stone and the suggestions thrown out by Dr. Thomas Young, he discovered the key to the graphic system of the Egyptians, the three elements of which—figurative, ideographic, and alphabetic—he expounded before the Institute in a series of memoirs in 1823. These were published in 1824 at the expense of the state. In 1826 Charles X appointed him to superintend the department of Egyptian antiquities in the Louvre; in 1828 he went as director of a scientific expedition to Egypt; and in 1831 the chair of Egyptian archæology was created for him at the Collége de France.

Chan′cellorsville, the site of one of the greatest battles of the American Civil War, in which, on May 2, 3, and 4, 1863, a nominal victory was gained by the Confederates under Generals Lee and Jackson over the Federal troops commanded by General Hooker. The Federal troops, though compelled to retreat across the Rappahannock, carried with them some thousands of prisoners and one more gun than they had lost, while the Confederates lost from 15,000 to 18,000 men and their brilliant leader, "Stonewall" Jackson.

Chan′cery, formerly the highest court of justice in England next to Parliament, but since 1873 a division of the High Court of Justice, which is itself one of the two departments of the Supreme Court of Judicature. In American law a court of general equity jurisdiction. Separate courts of chancery or equity exist in some of the states; in others the courts of law sit also as courts of equity; in others the distinction between law and equity has been abolished or never existed.

Chandausi (chan-dou-sē′), a town of India, N. W. Provinces, Moradabad district. Pop. 27,521.

Chan′dernagore, ("city of sandalwood"), a town in Hindustan, belonging to France, on the right bank of the Hooghly, 16 mi. n.n.w. of Calcutta. The French established a factory in it in 1676, and in 1688 obtained a formal cession of it, together with its territory of 2,325 acres, from Aurungzebe. It was three times occupied by the British, but was finally restored to the French in 1816. Pop. of town and territory 30,000.

Chandler, WILLIAM EATON, statesman, b. in Concord, N. H., 1835; graduated at Harvard law school in 1855, and in 1862 was elected to the state legislature. From 1868 to 1876 he served as secretary of the Republican national committee. On March 23, 1885, he was nominated for solicitor general of the U. S., but was not confirmed by the senate. In 1882 he became secretary of the navy, and held that office until 1885. In 1887 he was elected to fill a vacancy in the U. S. Senate, and was re-elected for the term ending in 1901.

Chandler, ZACHARIAH (1813–1879), American statesman. In 1851 he was elected mayor of Detroit, Mich. He assisted in organizing the Republican party, and in 1857 was elected U. S. senator. He was re-elected in 1863 and 1869, and in 1874 he was made secretary of the interior, which post he held until March 1, 1877. In 1876 he was chairman of the Republican national committee. He was re-elected to the U. S. Senate in February, 1879.

Chang-Chow-Foo, a city, China, province of Fokien, 36 mi. s.w. of Amoy, which is its port. It stands in a valley surrounded by hills and intersected by a river, and is the center of the silk manufacture of the province. Pop. est. at from 800,000 to 1,000,000.

Changarnier, NICOLAS (1793–1877), a French soldier. He distinguished himself in the Algerian campaigns from 1830 to 1847, and became general of division and maréchale-de-camp. In May, 1848, he became governor general of Algeria. In the same year he was recalled and was made commander in chief of the national guard of Paris. He was deprived of his command in 1851, and at the *coup d'état* of that year he was arrested and exiled. During the Franco-Prussian War he offered his sword to France and was sent to Metz. He opposed the surrender of that fortress and of Bazaine's army, but was overruled. After the war he was made a senator.

Channel Islands, a group of islands in the English Channel, off the west coast of department La Manche, in France. They belong to Britain, and consist of Jersey, Guernsey, Alderney, and Sark, with some dependent islets. The islands have been fortified at great expense. They form the only remains of the Norman provinces once subject to England. Area 112 sq. mi.; pop. 88,289.

Channing (chaning), WILLIAM ELLERY (1780–1842), a famous American preacher and writer,

b. at Newport, Rhode Island. in 1780. He studied at Harvard College, became a decided Unitarian, and propagated Unitarian tenets with great zeal and success. His first appointment as a pastor was in 1803, when he obtained the charge of a congregation in Boston, and ere long he became known as one of the most popular preachers of America. His reputation was still further increased by the publication of writings, chiefly sermons, reviews, etc., on popular subjects. His nephew, WILLIAM HENRY CHANNING (1810–1884), also a Unitarian preacher (for some time at Liverpool) and supporter of the socialistic movement, has written a memoir of his uncle, and other works.

Chantilly (shäṇ-tē-yē), a town, France, department of the Oise, 25 mi. n.n.e. of Paris, celebrated for a variety of lace made here and in the neighborhood, for the splendid château, built by the great Condé, but leveled by the mob at the Revolution; and also for another palace built by the Duc d' Aumaie after the estate came into his possession in 1850, which, along with the fine domain, was presented by the duke to the French Institute in 1887. It is a horse-racing center. Pop. 4,000.

Chant'rey, SIR FRANCIS (1781–1842), a noted English sculptor, b. near Sheffield, was the son of a well-to-do carpenter. In 1802 he commenced work for himself at Sheffield by taking portraits in crayons. After studying at the Royal Academy in London, he eventually settled in the metropolis, where he presented numerous busts at the exhibitions of the Royal Academy. His most celebrated works are the *Sleeping Children*, in Litchfield Cathedral; the statue of *Lady Louisa Russell*, in Woburn Abbey; the bronze statue of *William Pitt*, in Hanover Square, London; a statue of *Washington*, in the state house, Boston; and statues of *Horner*, *Canning*, *Sir J. Malcolm*, etc., in Westminster Abbey. His best works are his busts, but his full-length figures betray an insufficient acquaintance with anatomy, and several of his equestrian statues are still more defective.

Chanzy, ANTOINE EUGENE ALFRED (1823–1883), a French soldier. He distinguished himself in Italy and Algeria, and in 1870 commanded the army of the Loire. He was defeated at Le Mans, Jan. 12, 1871. In 1873 he was appointed governor general of Algeria, in 1875 was made a life senator, and in 1879 became ambassador at St. Petersburg.

Chao-Chow, a city, China, province Quang-Tong, on the river Han, 195 mi. n. e. of Hong-Kong, the center of an important maritime division of the province.

Chaos (kā'os), in old theories of the earth, the void out of which sprang all things or in which they existed in a confused, unformed shape before they were separated into kinds.

Chapola (chä-pa'la), a picturesque lake of Mexico, states of Xalisco and Michoacan. Area 1,400 sq. mi.

Chapin, EDWIN HUBBELL (1814–1880), American clergyman. He was ordained a minister in 1827, and had charge of a church in Richmond, Va., for three years, removing thence to

Charlestown, Mass. After six years of service there he became the colleague of Hosea Ballou in the School Street Universalist church, Boston. In 1848 he became pastor of the Fourth Universalist church in New York City. He became one of the most popular and prominent of the preachers of New York. He was a delegate to the Peace Congress at Frankfort-on-the-Main in 1850. He was a trustee of Bellevue Medical College and Hospital, and the Chapin Home for aged men and women was named in his honor.

Chapleau, JOSEPH ADOLPHE, Canadian statesman, b. in Quebec, Nov. 9, 1840. In 1873 he became solicitor general of the province. He was a strong conservative, and was considered the leading French-Canadian orator of the time. In 1879 he was premier of Quebec, and in 1882 became secretary of state for Canada.

Chapman, GEORGE (1557-1634), an English poet, the earliest, and perhaps the best, translator of Homer. His translation of the *Iliad* was published in three separate portions in 1598, 1600, and 1603. It has been highly commended by such poets as Pope, Keats, and Coleridge, as also by Lamb. Keats's sonnet, *On First Looking into Chapman's Homer* ("Then felt I like some watcher of the skies," etc.), is well known.

Chapoo, a seaport, China, province Chekiang, on the north side of a large bay, 35 mi. n. from Ningpo. It carries on a considerable trade with Japan.

Char (or Charr), a European fresh-water fish of the salmon genus, found plentifully in the deeper lakes of England, Wales, and Ireland, more rarely in those of Scotland. The chars inhabit the colder regions of deep waters, where the temperature is less liable to vary. The body somewhat resembles that of a trout, but is longer and more slender, as well as more brilliant in coloring, with crimson, rose, and white spots; weight sometimes 2 lbs., but generally under 1 lb. Char is much esteemed for the table.

Charade (sha-räd' or sha-rād'), a kind of riddle, the subject of which is a word that is proposed for discovery from an enigmatical description of its several syllables, taken separately as so many individual and significant words. When dramatic representation is used to indicate the meaning of the syllables and the whole word it is called an acting charade.

Char'coal, a term applied to an impure variety of carbon, especially such as is produced by charring wood. One kind of it is also obtained from bones; lampblack and coke are also varieties. Wood charcoal is prepared by piling billets of wood in a pyramid form, with vacuities between them for the admission of air, and causing them to burn slowly under a covering of earth. In consequence of the heat, part of the combustible substance is consumed, part is volatilized, together with a portion of water, and there remains behind the carbon of the wood, retaining the form of the ligneous tissue. Another process consists in heating the wood in close vessels, by which the volatile parts are driven off, and a char-

coal remains in the retorts, not so dense as that obtained by the other process. Wood charcoal, well prepared, is of a deep black color, brittle and porous, tasteless and inodorous. It is infusible in any heat a furnace can raise; but by the intense heat of a powerful galvanic apparatus it is hardened, and at length is volatilized, presenting a surface with a distinct appearance of having undergone fusion. Charcoal is insoluble in water, and is not affected by it at low temperatures; hence, wooden stakes which are to be immersed in water are often charred to preserve them, and the ends of posts stuck in the ground are also thus treated. Owing to its peculiarly porous texture, charcoal possesses the property of absorbing a large quantity of air or other gases at common temperatures, and of yielding the greater part of them when heated. Charcoal likewise absorbs the odoriferous and coloring principles of most animal and vegetable substances, and hence is a valuable deodorizer and disinfectant. It is used as fuel in various arts, where a strong heat is required, without smoke, and in various metallurgic operations. By cementation with charcoal, iron is converted into steel. It is used in the manufacture of gunpowder. In its finer state of aggregation, under the form of ivory-black, lampblack, etc., it is the basis of black paint; and mixed with fat oils and resinous matter, to give a due consistence, it forms the composition of printing ink.

Charente (shå-rän̈t), a river in Western France, rising in the department of Haute-Vienne, and falling into the sea about 8 mi. below Rochefort, opposite to the isle of Oleron, after a course of about 200 mi. It gives its name to two departments. CHARENTE, an inland department, formed chiefly out of the ancient province of Angoumois, and traversed by the river Charente; area 2,294 sq. mi.; capital Angoulême. The wines are of inferior quality, but they yield the best brandy in Europe, the celebrated cognac brandy being made in Cognac and other districts. Pop. 360,259. CHARENTE-INFÉRIEURE (aṇ-fā-ri-*eur*) ("Lower Charente"), a maritime department, comprises parts of the former provinces of Angoumois and Poitou: area 2,635 sq. mi. The wine is of common quality, and chiefly used for making brandy. Oysters and sardines abound on the coast. Salt and brandy are the only articles manufactured to any great extent. Capital La Rochelle. Pop. 456,202.

Cha'ring Cross, the titular center of London, so named from a cross which stood until 1647 at the village of Charing in memory of Eleanor, wife of Edward I. It is now a triangular piece of roadway at Trafalgar Square.

Chariot, a term applied to vehicles used both for pleasure and in war. Ancient chariots, such as those used among the Egyptians, Assyrians, Greeks, and Romans, were of various forms. A common form was open behind and closed in front, and had only two wheels. The chariot was strongly and even elegantly built, but not well adapted for speed. In ancient warfare chariots were of great importance. In the

Egyptian chariots the framework, wheels, pole, and yoke were of wood, and the fittings of the inside, the bindings of the framework, as well as the harness were chiefly of rawhide or tanned leather. We have number of sculptures which give a clear idea of the Assyrian chariots. These resemble the Egyptian in all essential features, containing almost invariably three men—the warrior, the shield-bearer, and the charioteer. A peculiarity of both is the quiver or quivers full of arrows attached to the side. From the front of the chariot a singular ornamental appendage stretches forward. War chariots had sometimes scythe-like weapons attached to each extremity of the axle, as among the ancient Persians and Britons. Among the Greeks and Romans chariot races were common.

Charlemagne (or Charles the Great) (747 [742?]–814), king of the Franks and first of the Holy Roman Emperors. Charlemagne was the son of Pepin the Short and grandson of Charles Martel. The *Carlovingian* dynasty takes its name from him, as its greatest representative. With his brother Carloman he succeeded his father (768). In 771 Carloman d., and the free vote of the Franks made Charlemagne sole king. His reign of forty-six years is filled with wars and conquests, as during that time he undertook fifty-two campaigns, the chief of which were against the Lombards, the Saracens, and the Saxons. Desiderius, king of the Lombards, having sought to obtain the succession for the children of Carloman, Charlemagne marched against him, seized all his possessions, and shut the deposed king in a monastery. Charlemagne placed on his own head the famous "Iron Crown of Lombardy" (774). Before leaving Italy he visited Rome and confirmed the donation made by his father to the pope of certain portions of Lombardy. This was the beginning of the papal claims to temporal supremacy. In 777 Charlemagne made an expedition against the Saracens in Spain. He was victorious, but on the return march across the Pyrenees, the rear of his army was attacked by the Gascons and Basques, wild mountaineers of that region, and cut to pieces in the famous Pass of Roncesvalles. Here fell the Christian knight Roland. Charlemagne's most frequent and important campaigns were against the Saxons, one of the few pagan German tribes at this time. He was determined to establish Christianity among them at any cost, but for more than thirty years they resisted him. During this struggle Charlemagne caused 4,500 Saxon prisoners to be massacred at one time. They at last yielded. In the year 800 Charlemagne was called to Rome by Pope Leo III to aid him against a hostile faction. The king speedily punished the pope's enemies, and before leaving Rome was magnificently rewarded for his services. During the festivities in the cathedral of St. Peter on Christmas Day, Pope Leo approached the kneeling king, placed on his head a crown of gold, and proclaimed him emperor of the Romans, the consecrated successor of Cæsar Augustus and Constantine. Since 476, when

the Roman Empire fell, the imperial seat had been at Constantinople. Charlemagne's empire, at his death, extended from the Baltic to the Mediterranean, from the Atlantic Ocean to the Danube, including modern France, Germany, Holland, Belgium, Switzerland, Hungary, a little of Spain, and most of Italy. His capital was at Aix-la-Chapelle. This splendid domain only a Charlemagne could rule. After his death it was harassed by the Northmen and by internal dissension, until finally by the treaty of Verdun in 843, it was divided among his three grandsons, Charles, Lothaire, and Lewis, the divisions made laying the foundations, subject to some territorial changes, of the modern nations, France, Italy, and Germany respectively. Charlemagne is famed as a statesman and a patron of learning. His laws are in part preserved in decrees called "Capitularies," more than a thousand in number. Commerce was protected, and robbers who preyed upon traveling merchants were severely dealt with. Agriculture was encouraged and improvements taught to the farmers, the emperor's own estates being a praiseworthy model. Charlemagne formed at his court a school for the nobles and their sons. The emperor himself learned to read Latin and even Greek, but could not write legibly. Charlemagne is said to have been of large stature and imposing presence, was regular and temperate. He is charged by some, probably without justice, with immorality. He was married four times and left one son, who became Lewis I, surnamed "Debonair."

Charleroi (shârl-r wä), a town in Belgium, prov. of Hainaut, on both sides of the river Sambre, 20 mi. e.n.e. Mons. It has manufactures of glass, hardware, etc., and woolen stuffs, and in the neighborhood are extensive pits of iron and coal. Pop. 21,879.

Charles, a name frequently used by European monarchs. Of the less important may be mentioned kings of France: Charles the Bald (823–877); Charles the Fat (832–888); Charles the Simple (879–929); Charles the Handsome (1294–1328); Charles the Wise (1337–1380); Charles the Silly (1368–1422); Charles VII, for whose kingdom Joan of Arc fought (1403–1461); Charles VIII (1470–1498); Charles IX (1757–1836). Emperors of Germany: Charles IV (1316–1378); Charles V (1500–1558); Charles VI (1685–1740); and Charles VII (1697–1744). The present reigning monarchs of the name include the kings of Portugal, Roumania, and Wurtemburg.

Charles I (1600–1649), king of England, Scotland, and Ireland, was born at Dunfermline, Scotland. He married Henrietta Maria, daughter of Henry IV of France, and in 1625 succeeded to the throne. After dissolving three Parliaments he concluded to reign alone. This he did for eleven years, using the arbitrary courts of High Commission and Star-chamber as a kind of cover for pure absolutism, and raising money by unconstitutional or doubtful means. The attempts of Charles to introduce an Anglican liturgy into Scotland produced violent tumults, and gave origin to

the famous *Covenant* in 1638, to oppose the king's design. An English army was sent north, but was defeated by the army of the Covenanters, and in 1640 a Parliament was again summoned, which proved to be the famous Long Parliament. The king had on his side the great bulk of the gentry, while nearly all the Puritans and the inhabitants of the great trading towns sided with the Parliament. The first action, the battle of Edgehill (Oct. 23, 1642), gave the king a slight advantage; but nothing very decisive happened till the battle of Marston Moor, in 1644, when Cromwell routed the royalists. The loss of the battle of Naseby, the year following, completed the ruin of the king's cause. Charles at length gave himself up to the Scottish army at Newark (May 5, 1646). He was beheaded before the Banqueting House, Whitehall, meeting his fate with great dignity and composure.

Charles II (1630–1685), king of England, Ireland, and Scotland, son of Charles I and Henrietta Maria of France. Cromwell was all-powerful in England; but Charles accepted an invitation from the Scots, who had proclaimed him their king July, 1650, and, passing over to Scotland, was crowned at Scone (1651). Cromwell's approach made him take refuge among the English royalists, who, having gathered an army, encountered Cromwell at Worcester, and were totally defeated. Charles escaped to France. On the death of Cromwell the Restoration, effected without a struggle by General Monk, set Charles on the throne after the declaration of Breda, his entry into the capital (May 29, 1660) being made amid universal acclamations. In 1662 he married the Infanta of Portugal, Catharine of Braganza. His reign was characterized by foreign and domestic troubles.

Charles XII (1682–1718), king of Sweden, was b. at Stockholm. On the death of his father, in 1697, when he was but fifteen years old, he was declared of age by the estates. To his jealous neighbors this seemed a favorable time to humble the pride of Sweden. Frederick IV of Denmark, Augustus II of Poland, and the Czar Peter I of Russia concluded an alliance which resulted in war against Sweden. With the aid of an English and Dutch squadron the Danes were soon made to sign peace, but Augustus of Saxony and Poland, and the czar were still in the field. After a long war Charles was defeated at Pultawa. He fled with a small guard and found refuge and an honorable reception at Bender, in the Turkish territory. Here he managed to persuade the Porte to declare war against Russia; but peace was soon procured and the interests of Charles were neglected. He was forced by the Turkish government to leave. Arrived in his own country in 1714, he set about the measures necessary to defend the kingdom, and the fortunes of Sweden were beginning to assume a favorable aspect when he was slain by a cannon ball as he was besieging Frederikshall.

Charles Edward Stuart (1720–1788), called the Young Pretender, grandson of James II,

king of England, son of James Edward and Clementina, daughter of Prince Sobieski, was b. in 1720 at Rome. In 1742 he went to Paris and persuaded Louis XV to assist him in an attempt to recover the throne of his ancestors. Fifteen thousand men were on the point of sailing from Dunkirk, when the English admiral Norris dispersed the whole fleet. Charles now determined to trust to his own exertions. Accompanied by seven officers he landed on the west coast of Scotland, from a small ship called the *Doutelle.* Many Lowland nobles and Highland chiefs went over to his party. With a small army thus formed he marched forward, captured Perth, then Edinburgh (Sept. 17, 1745), defeated an army of 4,000 British under Sir John Cope at Prestonpans (September 22), and advancing obtained possession of Carlisle. He now caused his father to be proclaimed king, and himself regent of England; removed his headquarters to Manchester, and soon found himself within 100 mi. of London, where many of his friends awaited his arrival. The rapid successes of the adventurer now caused a part of the British forces in Germany to be recalled. Want of support, disunion, and jealousy among the adherents of the house of Stuart, some errors, and the superior force opposed to him, compelled Prince Charles to retire in the beginning of 1746. The victory at Falkirk (Jan. 28, 1746) was his last. As a final attempt he risked the battle of Culloden against the Duke of Cumberland, April 16, 1746, in which his army was defeated and entirely dispersed. The prince now wandered about for a long time through the wilds of Scotland, often without food, and the price of $150,000 was set upon his head. At length, on Sept. 20, 1746, five months after the defeat of Culloden, he escaped in a French frigate. He received a pension yearly from France, and from Spain. Forced to leave France by the terms of the Peace of Aix-la-Chapelle (1748) he went to Italy, and in 1772 married a princess of Stolberg-Gedern, from whom eight years later he was separated. He latterly fell into habits of intoxication, and d. and was buried at Frascati. The funeral service was performed by his only surviving brother, Cardinal York, with whose death in 1807 the Stuart line ended. The cardinal received a pension from Britain of $20,000 a year till his death.

Charles Martel', ruler of the Franks, was a son of Pepin Héristal. He rendered his rule famous by the great victory which he gained in October, 732, over the Saracens, near Tours, from which he acquired the name of *Martel,* signifying *hammer.*

Charles River, a river in Massachusetts, which flows into Boston harbor, dividing Boston from Charleston.

Charleston, Charleston co., S. C., on peninsula between Ashley and Cooper rivers, has one of the finest harbors on the Atlantic coast. It is the port of a naturally rich section which produces abundant cotton and rice. Besides these, great quantities of naval stores and bone phosphate are exported. Railroads: South Carolina; Savannah & Charleston; and the Northwestern. The Santee Canal connects with the Santee River. The manufacturing interests are inferior to the commercial, the most important being in fertilizers and in the preparation of rice. Pop. est. 1899, 65,000.

Charleston, Kanawha co., capital of W. Va., on right bank of Kanawha River at its junction with the Elk, 130 mi. s. by w. of Wheeling. It is the central and distributing point of the valley which yields coal, iron, and hard wood timber. Railroads: Chesapeake & Ohio, and the Kanawha & Ohio. Principal industries: foundries, iron and sawmills, and factories. Pop. est. 1897, over 10,000.

Charleville (shårl-vēl), a town, France, department Ardennes. It has wide and regularly built streets, considerable manufactures, and a large trade in coal, iron, wine, etc. Pop. 16,185.

Char'lock, the vulgar name of a common yellow weed in cornfields, also called wild mustard. It also is a common cornfield weed, but having white or straw colored flowers and jointed pods.

Charlotte, Mecklenburg co., N. C., on Sugar Creek, 125 mi. w.s.w. of Raleigh. It is located in the N. C. gold region and partially dependent on the mines. Railroads: Wilmington, Charlotte & Rutherford; C. C. & A.; and the N. C. div. of the R. & D. Ry. Principal industries: cotton mills, etc. Population 1900, 18,091.

Charlotte-Amalie, a town, West Indies, capital of the Island of St. Thomas, one of the Virgin Islands, belonging to the Danes, on the south side of the island. It has an excellent harbor, and is a considerable entrepôt for goods for the neighboring islands. Pop. 12,000.

Charlottenburg (shår-lot'en-bu̇rh), a town of Prussia, on the Spree, about 3 mi. from Berlin, with a royal palace and park, and many places of amusement, as also a number of industrial and manufacturing establishments. Pop. 76,859.

Charlottesville, Albemarle co., Va., 97 mi. w. of Richmond. Railroads: Chesapeake & Ohio; and Southern Ry. Industries: woolen mills, knitting factory, and iron foundry. Became a city in 1887. Seat of University of Virginia. Pop. 1900, 6,449.

Charlottetown, Queen's co., province of P. E. I. Railroad, P. E. Island R. R., extending e. and w. to chief points of province. Industries: woolen mill, iron foundry, sash and door, soap, butter, and other factories. Surrounding country agricultural. The town was first settled in 1769 and became a city in 1855. Pop. 1900, 12,560.

Charon (kā'ron), in Greek mythology, the son of Erebus and Night. It was his office to ferry the dead in his boat over the rivers of the infernal regions. He was represented as an old man, with a gloomy aspect, matted beard, and tattered garments.

Chart, a hydrographical or marine map, that is a draught or projection of some part of the earth's surface, with the coasts, islands, rocks, banks, channels, or entrances into harbors, rivers, and bays, the points of compass,

soundings, or depth of water, etc., to regulate the courses of ships in their voyages. The term *chart* is applied to a marine map; *map* is applied to a draught of some portion of land (often including sea also). A *plane chart* is one in which the meridians are supposed parallel to each other, the parallels of latitude at equal distances, and of course the degrees of latitude and longitude everywhere equal to each other. A great number of excellent charts are produced by the hydrographic department of the British admiralty and are sold at a low rate. The U. S. Coast Survey Department produces similar charts. See *Coast Survey*.

Charter, a written instrument, executed with usual forms, given as evidence of a grant, contract, or other important transaction between man and man. *Royal charters* are such as are granted by sovereigns to convey certain rights and privileges to their subjects, such as the *Great Charter*, granted by King John, and charters granted by various sovereigns to boroughs and municipal bodies, to universities and colleges, or to colonies and foreign possessions; somewhat similar to which are charters granted by the state or legislature to banks and other companies or associations, etc.

Chartres, a city, France, capital of the department Eure-et-Loire, 49 mi. s.w. Paris. It is a very ancient city. The cathedral, one of the most magnificent in Europe, is rendered conspicuous by its two spires surmounting the height on which the city stands. Manufactures: woolen hosiery, hats, earthenware, and leather; there is a large trade. Pop. 23,108.

Chartreuse (chär-tr*euz*) (or Great Chartreuse), a famous Carthusian monastery in Southeastern France, a little northeast of Grenoble, situated at the foot of high mountains, 3,280 ft. above sea level, the headquarters of the order of the Carthusians. It was founded in 1084, but the present building, a huge, plain-looking pile, dates from 1676. The monks of this monastery manufacture the well-known liquor called *Chartreuse*, which owes its special properties to the aromatic plants growing on the Alps.

Charybdis (ka-rib′dis), an eddy or whirlpool in the Straits of Messina, celebrated in ancient times, and regarded as the more dangerous to navigators because in endeavoring to escape it they ran the risk of being wrecked upon Scylla, a rock opposite to it.

Chase, Salmon Portland (1808–1873), American statesman and jurist, b. in New Hampshire. Having adopted the law as his profession he settled at Cincinnati and acquired a practise there. He early showed himself an opponent of slavery, and was the means of founding the Free-soil party, which in time gave rise to the great Republican party—the power that brought the downfall of slavery. In 1849–55 he was a member of the U. S. Senate, in which he vigorously opposed the extension of slavery into the new territories. In 1855 he was elected governor of Ohio, being re-elected in 1857. In 1860 he was an unsuccessful candidate for the presidency. In 1861 he was nominated secretary of the treasury, and in this post was signally successful in providing funds for carrying on the Civil War. In 1864 he resigned office, and was appointed chief justice of the Supreme Court.

Chassepot Rifle (shâs-po), a breech-loading rifle, named after its inventor, and adopted as the firearm of the French infantry in 1866, but since given up. It was about 4 lbs. lighter than the needle gun and about 1 lb. lighter than the Martini-Henry rifle.

Chat, the popular name of birds of the warbler family. They are small, lively birds, moving incessantly and rapidly about in pursuit of the insects on which they chiefly live. The yellow-breasted chat is a large bird, belonging to the thrush family.

Chateaubriand (shä-tō-bri-äṇ), François Auguste, Vicomte de (1768–1848), a celebrated French author and politician. He went to London and published in 1797 his *Essai Historique*, which met with but small success. At this time the death of his mother and the accounts of her last moments transmitted to him by his sister helped to effect a certain change in the religious opinions of Châteaubriand, and from a not very profound skeptic he became a not very profound believer. In 1800 he returned to France, and in the following year published his romance of *Atala*, the scene of which is laid in America, and the year after his celebrated work, *Le Génie du Christianisme*, which is a kind of brilliant picture of Christianity in an æsthetic and romantic aspect. Style, power of description, and eloquence are the merits of the book rather than any depth of thought; but it carried the author's reputation far and wide, and contributed much to the religious reaction of the time. After a short career as diplomatist under Napoleon, Châuteaubriand made a tour in the East (1806–7), visiting Greece, Asia Minor, and the Holy Land. As the fruit of his travels he published *Les Martyrs* (1809) and *Itinéraire de Paris à Jérusalem* (1811). He hailed the restoration of Louis XVIII with enthusiasm, was appointed ambassador to Berlin, and then to London, but in 1824 quarreled with the premier, M. de Villèle, and was summarily dismissed. On the revolution of 1830 he refused to take the oath of allegiance to Louis Phillippe, forfeiting thus a pension of 12,000 francs. At this time his writings were chiefly political, and mostly appeared as newspaper articles, pamphlets, etc. In his later years he wrote several works, but none of the value of his earlier productions.

Chateau-Lafitte, famous vineyards, all in the department of the Gironde, France, furnishing the best of the red wines of Bordeaux.

Chateauroux (shä-to-rë), a town, France, capital of the department of Indre. It has straight, broad streets, and spacious squares. Cloth, cotton, hosiery, woolen yarn, paper, etc., are made; and there are tanneries and dye works. Pop. 23,924.

Chatham (chat′am), a town, naval arsenal, and seaport, England, county Kent, on the Medway, about 34½ mi. by rail from London. The importance of Chatham is due to the

naval and military establishments at Brompton in its immediate vicinity. The royal dockyard was founded by Queen Elizabeth previous to the sailing of the Armada. It has been greatly enlarged in recent years, and is now about 2 mi. in length, with most capacious docks, in which the heaviest warships can be equipped and sent directly to sea. Building slips, saw mills, metal mills, etc., and all the requisites of a great naval station are here on the largest scale and in the finest order. The military establishments include extensive barracks, arsenal, and park of artillery, hospital, store-houses and magazines, etc. The town is poorly built, but is defended by a strong line of fortifications which also serve as a flank defense for the metropolis. Pop. 59,210.

Chatham, a town of Canada, prov. Ontario, on the river Thames, 11 mi. n. of Lake Erie, with manufactures of machinery, iron castings and woolens, and a trade in lumber, etc. Pop. 9,052.

Chatham, WILLIAM PITT, EARL OF (1708–1778), one of the most illustrious statesmen of Britain, the son of Robert Pitt of Boconnoc, in Cornwall, educated at Eton and Oxford. He entered Parliament and soon attracted notice as a powerful opponent of Walpole. In spite of the king's dislike Pitt was powerful enough to win a place in the administration, first as vice-treasurer of Ireland, and afterward as paymaster-general. In 1756 he became secretary of state and the real head of the government. Dismissed in 1757 on account of his opposition to the king's Hanoverian policy, no stable administration could be formed without him, and he returned to power the same year in conjunction with the Duke of Newcastle. It was under this administration and entirely under the inspiration of Pitt that Britain rose to a place among the nations she had not before occupied. Wolfe and Clive, both stimulated and supported in their great designs by Pitt, won Canada and India from the French, and the support the Great Commoner gave Frederick of Prussia contributed not a little to the destruction of French predominance in Europe. The accession of George III brought Lord Bute into power, and Pitt, disagreeing with Bute, resigned in 1761. In 1766 he strongly advocated conciliatory measures toward the American colonies, and undertook the same year to form an administration, he going to the House of Lords as earl of Chatham. But the ministry was not a success, and in 1768 he resigned. After this his principal work was his appeals for a conciliatory policy toward the colonies. But his advice was disregarded, and the colonies declared themselves independent in 1776. He received a public funeral and a magnificent monument in Westminster Abbey.

Chatham Islands, a group of three islands in the South Pacific Ocean, belonging to New Zealand. The soil is in many places fertile, and crops of potatoes, wheat, and vegetables are successfully grown. Cattle and sheep are reared, and thus whaling or other vessels that call are supplied with fresh provisions as well as with water. The present population amounts to only 285. The islands were discovered in 1791.

Chattahoo'chee, a river, rising in the Appalachian Mountains in Georgia, and forming for a considerable distance the boundary between Georgia and Alabama. In its lower course, after the junction of the Flint River, it is named the Appalachicola, and is navigable to Columbus in Georgia for steamboats. Total course, about 550 miles.

Chattanooga, Hamilton co., Tenn., at foot of Lookout Mountain, on left bank of Tennessee River, 156 mi. s.e. of Nashville. Surrounding country agricultural and mineral. Railroads: N. & C.; W. & A.; A. & C.; Cincinnati Southern; E. T. V. & G.; and Memphis and Charleston. Its industries embrace cotton mills, tanneries, iron, nail, steel, and machine companies, rolling mills, furnaces, railroad car, furniture, and other factories. The wholesale trade is very extensive, having representatives in every branch. Pop. 1900, 32,490.

Chat'terton, THOMAS (1752–1770), a youth whose genius and melancholy fate have gained him much celebrity, was b. at Bristol, England, of poor parents, and educated at a charity school. At the age of fourteen he was apprenticed to an attorney. In 1768, when the new bridge at Bristol was completed, he inserted a paper in the Bristol *Journal* entitled *A Description of the Friars' First Passing over the Old Bridge*, which he pretended he had found along with other old manuscripts in an old chest in St. Mary Redcliffe church, Bristol. He also showed his friends several poems of similarly spurious antiquity which he attributed to one Rowley. In 1769 he ventured to write to Horace Walpole, then engaged upon his *Anecdotes of Painters*, giving him an account of a number of old Bristol painters which was clever enough to deceive Walpole for a time. Dismissed from the attorney's office, he left with his manuscripts for London, where a favorable reception from the booksellers gave him high hopes. For them he wrote numerous pamphlets, satires, letters, etc., but got no substantial return, and his situation became daily more desperate. At last, after having been several days without food, he poisoned himself.

Chau'cer, GEOFFREY (1340–1400), "the father of English poetry." Nothing is known of his education, but in 1356–59 he was a page to Princess Lionel. He tells us himself that in 1359 he bore arms in France and was taken prisoner. He was ransomed next year. In 1367 we find his name as a valet of the king's chamber. In 1367 he received a pension of twenty marks, and between 1370 and 1380 he was employed abroad in seven diplomatic missions. In one of these, in 1372, he was sent to Genoa as a commissioner to negotiate a commercial treaty. In 1374 he was appointed comptroller of the customs on wool at London, also received an annual allowance. In 1377 he was sent to Flanders and France on diplomatic business, and next year to Lombardy. In 1382 he was appointed comptroller of the petty

customs. In 1386 he was returned to Parliament as knight of the shire for Kent, but in the same year he shared the disgrace of his patron, John of Gaunt, was dismissed from his comptrollerships, and reduced to a state of comparative poverty. Three years later, however, he was made clerk of the works, and afterward had other offices and one or two annuities bestowed upon him. In 1399 he got a pension of forty marks from Henry IV, but did not live long to enjoy it. His most celebrated work, *The Canterbury Tales*, was written at different periods between 1373 and 1400. It consists of a series of tales in verse (two in prose), supposed to be told by a company of pilgrims to the shrine of St. Thomas (Becket) at Canterbury in 1386. In its pages we get such pictures of English life and English ways of thought in the fourteenth century as are found nowhere else. Besides his great work Chaucer wrote many poems some of which are founded on French or Italian works. He was buried in Westminster Abbey.

Chaudière (shōd-yār), a river of Canada, Quebec province, which rises on the borders of Maine, near the sources of the Kennebec, and flows into the St. Lawrence about 6 mi. above Quebec. The banks of the river are generally steep and rocky, and about 3 mi. above its junction with the St. Lawrence are the Chaudière Falls, about 120 ft. high. On the Ottawa River are two other falls of lesser dimensions known as the Great and the Little Chaudière.

Chauncey, Isaac (1772–1840), American naval officer. He became captain of a merchant ship in 1791, and in 1798 entered the U. S. navy as a lieutenant, and was soon promoted. In the War of 1812 he commanded on the lakes, assisted in the capture of Toronto and Fort George, and defeated the British fleet under Sir James Yeo. He afterward commanded in the Mediterranean. For many years he was president of the board of navy commisioners.

Chaus(kā′ us), a genus of Asiatic and African lynxes or cat-like animals, including the Libyan chaus, and the Caffer-cat. They are fond of the water, and excellent swimmers.

Chautauqua, on Lake Chautauqua in the western part of New York, represents an important educational movement, which originated in 1874 under the leadership of Dr. J. H. Vincent, New York City, and Lewis Miller, Akron, O.; 136 acres of land were laid out in the woods, and trees cut away for cottages and parks. The whole is illuminated with electric lights, has the best of sanitary arrangements, and is abundantly supplied with pure water. The original idea to combine innocent amusements of the summer recreation hours with worthy educational pursuits has been well carried out. Instruction is given on a variety of subjects. A literary and scientific circle was organized in 1872 to promote habits of reading and study at home, among those who had left school, or whose educational advantages had been limited. The Chautauqua circle is a home college for young and old. The course of study adopted requires an average of forty minutes reading each day for four years. Local circles have been organized in many parts of the world. Graduates receive diplomas. At the first commencement, Aug. 12, 1882, sixteen hundred graduates received diplomas, among the number a lady eighty years old. Every summer there is a six-weeks' session. School of languages, teachers' retreats, missionary institutes, literary and scientific circles, etc., are open. Lectures, concerts, class drills, children's meetings, etc., attract thousands to this sylvan retreat. A model of Palestine, an Egyptian pyramid, an Oriental house, the children's temple, and the art and archeological museum are points of interest. These summer meetings are the inspiration to effort, but the real work is done at the homes.

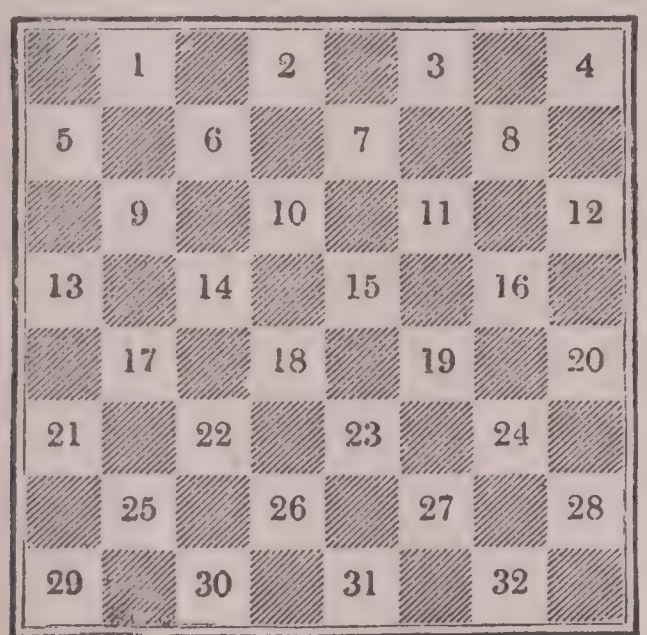
Chaux-de-Fonds (shōd-foṇ), a town, of Switzerland, in the canton and 9 mi. n.w. of the town of Neufchâtel, in a deep valley of the Jura. The inhabitants are largely engaged in the making of watches and clocks, of which Chaux-de-Fonds and Locle are the chief centers in Switzerland, and in similar branches of industry. Pop. 22,456.

Cheboygan, Cheboygan co., Mich., on Straits of Mackinaw and Cheboygan River, 163 mi. n. of Bay City. Railroad, Michigan Central. Industries: tannery, two flouring mills, three iron foundries, nine saw mills, shingle and planing mills, wood works. Surrounding country agricultural. The town was first settled in 1840 and became a city in 1889. Pop. 1900, 6,489.

Check, a draft or bill on a bank payable on presentation. A check may be drawn payable to the bearer, or to the order of some one named: the first form is transferable without endorsement, and payable to any one who presents it; the second must be endorsed, that is, the person in whose favor it is drawn must write his name on the back of it. Checks are a very important species of mercantile currency wherever there is a well-organized system of banking. The regular use of them for all payments, except of small amount, makes the transfer of funds a mere matter of cross-entries and transferring of balances among bankers, and tends greatly to economize the use of the precious metals as a currency.

Checkers, a game played with "men" on a checkered board, like a chessboard, of sixty-four black and white squares. It was played in Europe in the sixteenth century, and in 1668 a treatise on the game was published in Paris by Mallet. The Greeks and Romans had a similar game, and the Egyptians are represented on monuments as engaged in some such amusement. The figure represents the board, numbered in the usual method for registering games. Two players, each having a set of twelve men — one set white, the other black (or round and square, or distinguished in any other way) — sit opposite each other, having their men arranged on squares 1 to 12 and 21 to 32 respectively. The men can be placed either on the black or white squares,

but the whole must be placed on one color only. Whichever color is used, however, the single corners 4 and 29 must be at the players' *left* hand. The object of the game is to clear off the opponent's men altogether from the board, or to so shut them up that they cannot be moved. Generally the black men play first, and as the men are changed each game, the first move becomes alternate. Each player alternately moves one man at a time diagonally forward, always keeping on the same colored squares. When an enemy's man stands in the way, no move can be made unless there be a vacant square immediately beyond, into which the man can be lifted, in which case the man leaped over is "taken," and removed from the



Checker Board.

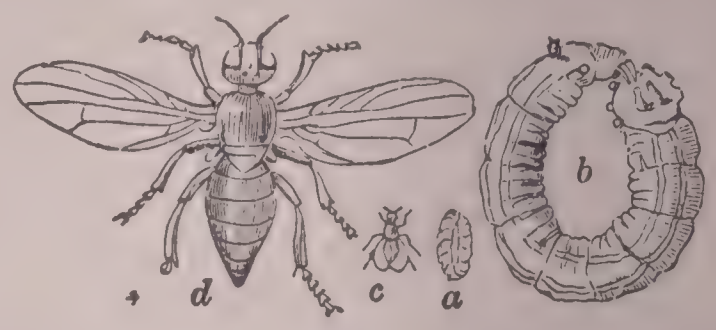
board; and so on, till the game is lost and won, or drawn. When a man on either side has succeeded in making his way to the opposite side of the board, he becomes *crowned*, which is done by putting another man on the top of him, and he can then move in any diagonal direction, but always only one square at a time.

Ched'dar, a village, England, county Somerset, 18 mi. s.w. Bristol. The dairies in the neighborhood have long been famous for the excellence of their cheese, which is made from the whole milk, and the whey skimmed off, heated, and added to the curd.

Cheese, one of the most important products of the dairy, is composed principally of *casein*, which exists in cows' milk to the extent of about 3 or 4 per cent., fat and water. It is made from milk, skimmed wholly, partially, or not at all, the milk being curdled or coagulated, and the watery portion or whey separated from the insoluble curd, which being then worked into a uniform mass, salted and pressed in a vat, or mold forms cheese, but requires to be *cured* or *ripened* for a time. The coagulation of the milk may be effected either by adding an acid as in Holland, or sour milk as in Switzerland, or rennet as usual in Britain and this country. There are a great many varieties of cheese, of which the most notable are Stilton, Cheshire, Cheddar, Dunlop, among British; and Parmesan, Gruyère, Gorgonzola, Gouda,

among foreign ones. In the U. S. immense quantities of cheese are made. Large factories are devoted to the manufacture. Other kinds are known as sour-milk, skimmed milk, cream, sweet-milk, etc., cheese. Sheep and goat's milk cheese are also made.

Cheese Fly, a small black dipterous insect bred in cheese, of the same family to which the house fly, blow fly, etc., belong. It has a very extensible ovipositor, which it can sink



Cheese Hopper. *a.*—larva, natural size; *b.*—larva, magnified, preparing to spring; *c.*—perfect insect, natural size; *d.*—magnified.

to a great depth in the cracks of cheese, and lay its eggs there. The maggot, well known as the cheese hopper, is furnished with two horney claw-shaped mandibles, which it uses both for digging into the cheese and for moving itself, having no feet. Its leaps are performed by a jerk, first bringing itself into a circular attitude, when it can project itself twenty to thirty times its own length.

Che-Kiang, a maritime province of China, including the Chusan Archipelago; area 39,150 sq. mi.; pop. 11,588,692. It is traversed by the Grand Canal, and has as its principal ports Ningpo and Hang-Chow-Foo, the capital. Staple exports, silk and tea.

Chelsea (chel'sē), a suburb of London, England, chiefly distinguished for containing a royal military hospital, originally commenced by James I as a theological college, but converted by Charles II for the reception of sick, maimed, superannuated soldiers. Pop. 96,272.

Chelsea, Suffolk co., Mass., separated from East Boston by Mystic River. Railroad, Eastern & Grand Junction. Principal industries: foundry and machine ship products, curried leather, cotton goods, tobacco, rubber, linseed oil, woolens, brushes, soap, mattresses, and paper box manufactories. Contains a U. S. marine hospital, naval hospital, and U. S. powder magazine. Pop. 1900, 34,072.

Cheltenham (chel'tn-am), a fashionable watering place in England, in the county of Gloucester, within the shelter of the Cotswold Hills. It grew rapidly into a place of fashionable resort after the discovery of its saline, sulphuric, and chalybeate springs in 1716, to which, in 1788, George III paid a visit. Pop. 42,914.

Chemical Rays, a not very appropriate name given to the blue and violet rays of the spectrum, and also the non-luminous rays at the violet end of the spectrum, which have a peculiarly powerful chemical effect on silver compounds.

Chemistry, the science which treats of the nature, laws of combination, and mutual ac-

tions of the minute particles of the different sorts of matter composing our universe, and the properties of the compounds they form. As a science it is entirely of modern origin, in its earliest phases being identical with alchemy, the great object of which was the discovery of the philosopher's stone. In this pursuit most minerals, especially such as presented the characters of metallic ores, were subjected to numerous experiments, and many important isolated discoveries were made by Basil Valentine, Raymond Lully, Paracelsus, Van Helmont, and others. But during the latter part of the seventeenth century the belief in alchemy was greatly on the wane, and just at its close the German chemist Becher threw out certain speculations regarding the cause of combustion, which were afterward taken up and extended by Stahl in the "phlogistic theory," and constitute the first generalization of the phenomena of chemistry, though the theory itself was diametrically opposed to the truth. About the middle of the last century Doctor Black made his great discovery of a gas differing from atmospheric air, rapidly followed by that of a number of other gases by Cavendish, Rutherford, Priestley, Scheele, etc.; and the discovery of oxygen by the two last-named chemists afforded to Lavoisier the means of revolutionizing and systematizing the science. By a series of experiments he showed that all substances, when burned, unite with oxygen, and that the weight of the products of combustion is exactly equal to that of the combustible consumed and of the oxygen which has disappeared. The application of this theory to the great majority of the most important chemical phenomena was obvious, and the Stahlian hypothesis disappeared from the science. A yet more important step was the discovery by Dalton of the laws of chemical combination. His theory was immediately taken up by Berzelius, to whose influence and careful determination of the chemical equivalents of almost all the elements then known its rapid adoption was mainly due. To Berzelius we owe almost all the modern improvements in the methods of analysis, and to Sir H. Davy the foundation of electro-chemistry. Of late years every branch of the science has advanced, but the most extraordinary progress has been made in organic chemistry. The investigations of chemists have shown that the great majority of the different substances found at the surface of the earth can be broken up into several substances of less complicated nature, which resist all further attempts to decompose them, and appear to consist of only one kind of matter. These substances, by union of which all the different sorts of known matter are built up, are about seventy in number, and are called the *chemical elements.* The list (given below) includes such substances as gold, iron, oxygen, hydrogen, carbon, calcium, etc. When any two or more of these elements are brought in contact, under the proper conditions, they may unite and form chemical compounds of greater or less complexity, in which the constituents are held in union by a

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form of energy which has received the name of chemical affinity. This affinity is characterized by its acting between dissimilar particles, and producing a new kind of matter, readily distinguishable from either of the substances combining to form it, and which cannot be again separated into its elements by merely mechanical processes.

Laws of Combination.—1, Chemical combination takes place between the smallest particles of matter and at inappreciable distances. Thus fragments of phosphorus and iodine may be placed near each other, but do not combine until brought into actual contact. 2, Chemical combination invariably effects a change in all bodies. There are changes of state, temperature, color, volume, taste, smell, etc. 3, Chemical combination takes place with different degrees of force in different bodies. The more unlike two bodies are the greater the violence with which they combine. 4, Chemical combination is much affected by other forces. Heat, light, electricity, mechanical force, etc., may either accelerate or retard chemical combination. 5, All substances, elementary and compound, combine together in fixed and definite proportions by weight. 6, When bodies combine in more than one proportion their other combining proportions are simple multiples of the lowest. Thus, 28 parts of nitrogen combine with 16 parts of oxygen to form nitros oxide, while 28 parts of the former and 32 of the oxygen produce nitric oxide, and an additional 16 of oxygen forms nitric trioxide, etc. 7, Gases combine in fixed and definite proportions by volume as well as by weight. If one volume of each gas be combined together, two volumes of the gaseous compound result. If more than one volume of each combine together, the new compound only occupies two volumes, however great the aggregate number of volumes is before combination takes place. 8, The combining proportions of compounds are the sum of the combining proportions of their constituent elements.

The *atomic weight* of any element is now assumed to be the smallest quantity which can enter into or be expelled from combination, one part of hydrogen being taken as the standard.

Nomenclature.—The names employed by the old chemists were generally derived from some property of the body or indicated the mode in which it was prepared, and sometimes the substance from which it was obtained. Soon after the introduction of Lavoisier's system, the French Academy of Sciences appointed a committee to improve it; and the chief merit of the one introduced is due to Guyton Morveau. The names applied to the elements were as far as possible derived from some conspicuous property they possess. An attempt has been made to make the name express also the class to which the substance belongs. Thus all the metals (except those long known) are made to terminate in *um*, as potassium, barium, etc.; and the substances allied to chlorine have a similar termination to it. The nomenclature

of compounds was based on the existence of two classes of substances opposed to one another in their properties, and known as *acids* and *bases*. All the bases known at the close of the last century were oxygen compounds, and they were known by the general name of *oxides*. The compounds of chlorine, iodine, and bromine, and subsequently those of sulphur, carbon, boron, and silicon, though really belonging to a different class, were called chlorides, iodides, bromides, sulphides, etc. After the atomic theory came into use, the term oxide was confined to a compound containing one atom of oxygen in combination with one of the other elements. The compound containing two atoms of oxygen became a dioxide, that with three a trioxide, and so on; the numeral prefix always expressing the number of atoms of oxygen. So also we speak of a protochloride and bichloride, a protosulphide and bisulphide. So also there are a number of oxides containing two equivalents of metal to three of oxygen; such compounds are called sesquioxides. Of late years it has been found preferable to use names of less precision, and to distinguish only between the larger and smaller proportions of oxygen. Thus there are two oxides of iron possessing basic properties, which are called respectively ferrous, and ferric oxide, the termination in *ous* being used in all cases for the compound containing the smaller, and that in *ic* for the one containing the larger quantity of oxygen, the Latin name of the element being usually employed. Both systems, however, are still in common use.

The nomenclature for compounds possessing acid instead of basic properties, has its origin in part in the belief entertained by chemists in the last century that all acids were oxygen compounds, and that it was therefore unnecessary to indicate the existence of oxygen in them, as the word acid sufficiently did so. Thus sulphur forms two different acid compounds, one with a smaller proportion of oxygen than the other, called respectively sulphurous and sulphuric acids; and similarly we have chlorous and chloric acids, etc. The contrivers of the present nomenclature did not provide for more than two acid compounds of any one element, that being the largest number then known. But since that time it has been found that there may be four or five such compounds necessitating the use of a distinctive prefix. In the case of chlorine and oxygen, after the name chloric acid had been made use of, another acid containing a larger quantity of oxygen was discovered, for which the name of hyperchloric acid, usually shortened into perchloric acid, was devised. Further observation, however, showed that there were many powerful acids which contained no oxygen, but that hydrogen was invariably present, and it became necessary to distinguish those which contained hydrogen only. Accordingly we have hydrochloric acid, a compound of hydrogen and chlorine, in contrast with chloric acid, a compound of hydrogen, chlorine, and oxygen; and hydrosulphuric acid, a compound of hydrogen and sulphur, in contrast with sulphuric acid, a compound of hydrogen, sulphur, and oxygen.

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The names of acids were formed in order to enable chemists to have simple designations for *salts*, a class of bodies produced when a metal takes the place of the hydrogen of an acid. Thus the termination in *ate* expressed the fact that the salt is derived from an acid whose name terminates in *ic*, and the salts of acids whose names end in *ous* have their termination in *ite*. Very frequently two salts, generally of the same acid, combine to form what is usually known as a double salt, as, for instance, potassium sulphate and zinc sulphate combine, and the compound is called the zinco-potassic sulphate.

This system of nomenclature, which fulfilled the requirements of chemistry at the time it was devised, became less and less convenient as more complex compounds were discovered, and many attempts have been made to modify and extend it. These attempts, however, have uniformly failed to meet the approval of chemists.

Symbols.—Very soon after the publication of Dalton's views Berzelius introduced a system of symbols by which the composition of the more complex chemical compounds can be represented with much greater precision than any nomenclature admits of; and the plan proposed by him, though with some modifications, is now universally accepted. Every element is represented by a symbol, which is the initial letter of its Latin name. Where several elements have the same initial a small letter is attached to it for the sake of distinction. These symbols are further understood in all cases to represent an atom of each element. The symbols of compounds are formed by the juxtaposition of those of their elements. Thus—

H Cl,.....Hydrochloric acid,
Ba S,.....Baric sulphide,

express the fact that these compounds contain single atoms of their constituents; that hydrochloric acid, for example, is a compound of 1 part of hydrogen and 35.5 of chlorine; and baric sulphide of 137 parts of that metal and 32 of sulphur. When more than one atom of an element exists in any compound this is indicated by a small figure placed after its symbol, and a little below. Where it is necessary to express more than one atom or molecule of the compound this is done by prefixing to the symbol a large number written on the line. By a systematic arrangement of the symbols in each compound an attempt is made to indicate to a certain extent their chemical functions. Thus, in an acid, the hydrogen, which may be replaced by a metal, begins the formula of the compound.

The symbols are also very advantageously used to express the changes which occur during chemical action, and they are then written in the form of an equation, of which one side represents the condition in which the substances exist before the change, the other the result of the reaction.

Atomicity.—When an atom of chlorine, weighing 35.5, is brought in contact with hydrogen it is found to combine only with one atom of that substance. When an atom of oxygen, weighing 16, comes in contact with hydrogen, however, it combines with two parts, or two atoms, of that element. An atom of nitrogen, weighing 14, combines only with three parts or three atoms of hydrogen. These elements are therefore said to possess different *atomicities;* hydrogen is called a *monatomic* element, oxygen *biatomic*, and nitrogen *triatomic*. With reference to this fact, therefore, the elements have been divided into several classes according to the number of atoms of hydrogen to which they are equivalent, or with which they can combine, and they are described as monads, diads, triads, etc. No physical explanation of the cause of this peculiarity of the different elements has yet been obtained. This variation in atomicity has been accounted for by supposing that two atomicities in an element can neutralize or saturate one another.

Molecules.—The molecule of a compound is the quantity of it which exists in two gaseous volumes, so that we do not speak of the atom of a compound, but of its molecule, that being the smallest quantity of a compound which can be obtained in the separate state. This and other considerations have led to the further hypothesis, that *atoms* never exist in a separate state, but that, as soon as they are separated from compounds, they enter into combination with one another.

Compound Radicals.—In every perfect molecule all the bonds of the elements which combine are saturated, and the affinities being perfectly satisfied, the molecule has no disposition to combine directly with any other substance; but if several elements are combined in such a manner that one or more bonds remain unsatisfied, the compound so produced has in general very powerful affinities, and unites readily with any substance capable of saturating its uncombined bond.

Classification of Compounds.—The properties of chemical compounds may be classified not merely under the head of the particular elements they contain, but also according to their special chemical functions. The advantages of the latter method were early recognized, and the distinction between *acids* and *alkalies* dates back to a period long previous to the ascertainment of their true nature. An acid is now described as a compound containing a certain quantity of hydrogen, easily replaceable by a metal when it comes in contact with it either in the free state or as an oxide.

Bases are compounds which, by reacting on acids, yield salt. The most important bases are oxides of metals, and they are divided into several sections, of which the most important are the alkalies. These substances are the hydrates of the so-called alkaline metals, and may be compared to water in which an atom of hydrogen is replaced by an atom of metal. Most of the bases, excepting the alkalies, are insoluble in water, and without any effect on vegetable colors. Another class of bases of great importance is typified by ammonia.

Sulphides are compounds of the metals with sulphur, and form a very important class of compounds. They are obtained either by heating the metals with sulphur in proper proportions, or by passing a current of hydrosulphuric acid gas through a solution of a salt. They exist abundantly in the mineral kingdom, and form some of the most important ores. Some of the sulphides are capable of acting as bases and others as acids, and by combination a class of salts, usually distinguished as sulphur salts, can be obtained. The greater part of the sulphides are insoluble in water, and some of them possess extremely fine colors, and are used as paints.

Organic and Inorganic Chemistry.—Organic chemistry is that branch of the science which treats of the compounds existing in plants and animals, or which may be produced from substances found ready formed in their tissues. It was at first believed that these compounds were peculiar in their constitution, quite distinct in their chemical relations, and produced by what was called vital affinity. The discovery by Wöhler, however, that urea could be produced artificially from purely mineral substances entirely altered this view; and since then the artificial production of many organic compounds has practically annulled the distinction between organic and inorganic chemistry, except as a matter of convenience. Organic chemistry is now most commonly defined as the chemistry of the carbon compounds, for that element is found in every substance which can be extracted from plants and animals, in combination with hydrogen, oxygen, nitrogen, and less frequently with sulphur and phosphorus. These elements are so combined as in many cases to form compounds of extreme complexity, the constitution of some of which is still a matter of much difference of opinion among chemists; but the constitution of the simpler organic compounds is now thoroughly understood.

Chemnitz (*h*em′nits) the principal manufacturing town in the kingdom of Saxony, on the Chemnitz. The principal manufactures are white and printed calicoes, ginghams, handkerchiefs, woolen and half-woolen goods, etc. There are also extensive cotton spinning mills, and mills for the spinning of combed wool and floss silk; dye works, print works, bleach works, chemical works; large manufactures of cotton hose, etc. The manufacture of machinery also has now become important. Pop. 110,817.

Chemosh (kē′mosh), the national god of the Moabites, who were on that account called "the people of Chemosh." At an early period the same deity appears too as the national god of the Ammonites, though his worship seems afterward to have given place to that of Moloch, if Moloch be not merely another name for the same deity. The worship of Chemosh was even introduced among the Hebrews by Solomon.

Chemulpo (chē-mul′pō), one of the three treaty ports of Corea, exporting beans, gin-

seng, etc., and importing European and American manufactures.

Chenab (chen-åb′), a river in Hindustan, one of the five rivers of the Punjab. It rises in the Himalayan ranges of Kashmir, and entering the Punjab near Sialkot, flows in a southwesterly direction till it unites with the Jehlam; length about 800 mi.

Cheney, CHARLES EDWARD, American clergyman, b. in Canandaigua, N. Y., Feb. 12, 1836. He graduated at Hobart College in 1857, and entered the Episcopal ministry. In 1873 he assisted in organizing the Reformed Episcopal Church of which he was made bishop.

Chenille (she-nil′), a sort of ornamental fabric of cord-like form, made by weaving or twisting together warp threads with a transverse filling or weft, the loose ends of which project all round in the form of a pile. Chenille carpets have a weft of chenille, the loose threads of which produce a fine velvety pile.

Cheops (kē-ops), the name given by Herodotus to the Egyptian despot whom the Egyptians themselves called Khufu. He belonged to the rulers who had for their capital Memphis; lived about 2800–2700 B. C., and built the largest of the pyramids. According to Herodotus he employed 100,000 men on this work constantly for 20 years.

Chephren (kef′ren) (or Cephren), was the successor of Cheops as king of Egypt, and the builder of the second pyramid. His name is properly Khafra.

Cher (shār), a river of Central France, a tributary of the Loire, which it enters near Tours; length 200 mi.

Cher (shār), a department of Central France, named from the river Cher, and formed from part of the old provinces of Berry and Bourbonnais; area 2,779 sq. mi.; capital Bourges. The forests and pastures are extensive. More grain and wine are produced than the demands of the inhabitants require. The preparation and manufacture of iron, called Berry iron, is the principal branch of industry. The department is divided into three arrondissements. Pop. 355,349.

Cherbuliez, VICTOR, French author, b. at Geneva, of French parentage, in July, 1829; studied at Paris, Bonn, and Berlin, and wrote romances of notable excellence. On Nov. 8, 1881, he was elected a member of the French Academy.

Cheribon (sher′i-bon), a seaport in the island of Java, capital of the province of the same name. The province lies on the coast toward the northwest, produces coffee, timber, arecanuts, indigo, and sugar, and has about 770,000 inhabitants. The town lies in a deep bay on the north coast, and is the residence of a Dutch governor. Pop. 11,000.

Cherimoy′er (cher-), a fruit, native of South and Central America, allied to the custard apple. It is heart-shaped, with a scaly exterior, and numerous seeds buried in a delicious pulp. Both flowers and fruit emit a pleasant fragrance. This fruit is now cultivated in various tropical regions.

Cherokees′, a tribe of North American Indians, occupying an allotted region in the Indian Territory. Their old seats were in Georgia, Alabama, Mississippi, and Tennessee. The Cherokees are the most enlightened of the Indian tribes, have an alphabet, printed books and newspapers in their own language, live in well-built villages, and have an excellent school system. Their numbers are about 20,000.

Cherry, a fruit tree of the prune or plum tribe, very ornamental, and therefore much cultivated in shrubberies. It is a native of most temperate countries of the northern hemisphere, and in Britain is quite common in the wild state, besides being cultivated for its fruit. The cultivated varieties probably

Common Cherry; *a.*—blossom.

belong to two species. They are numerous, as the red or garden cherry, the red heart, the white heart, the black cherry, etc. The fruit of the wild cherry is often as well flavored, if not quite so large, as that of the cultivated varieties. It is said that this fruit was brought from Cerasus, in Pontus, to Italy, by Lucullus about B.C. 70, and introduced into England by the Romans about A.D. 46. The cherry is used in making the liquors Kirschwasser and Maraschino. The wood of the cherry tree is hard and tough, and is very serviceable to turners and cabinet makers. An ornamental but not edible species is the bird cherry. The wild cherry of this country is a fine large tree, the timber of which is much used by cabinet makers and others, though the fruit is rather astringent.

Cherry Laurel, the common name of an evergreen shrub, a native of Asia Minor, but now naturalized in America and common in shrubberies. It is commonly called laurel, but must not be confounded with the sweet bay or other true species of laurel. The leaves yield an oil nearly identical with that got from bitter almonds. The distilled water (called "laurel water") from the leaves is used in medicine. The Portugal laurel is another species.

Chersonesus (ker-so-nē′sus) (Greek, "a peninsula"), anciently a name applied to several peninsulas, as the Cimbrian Chersonesus, now Jutland, etc., the Tauric Chersonesus, the

peninsula formed by the Black Sea and the Sea of Azoff—the Crimea.

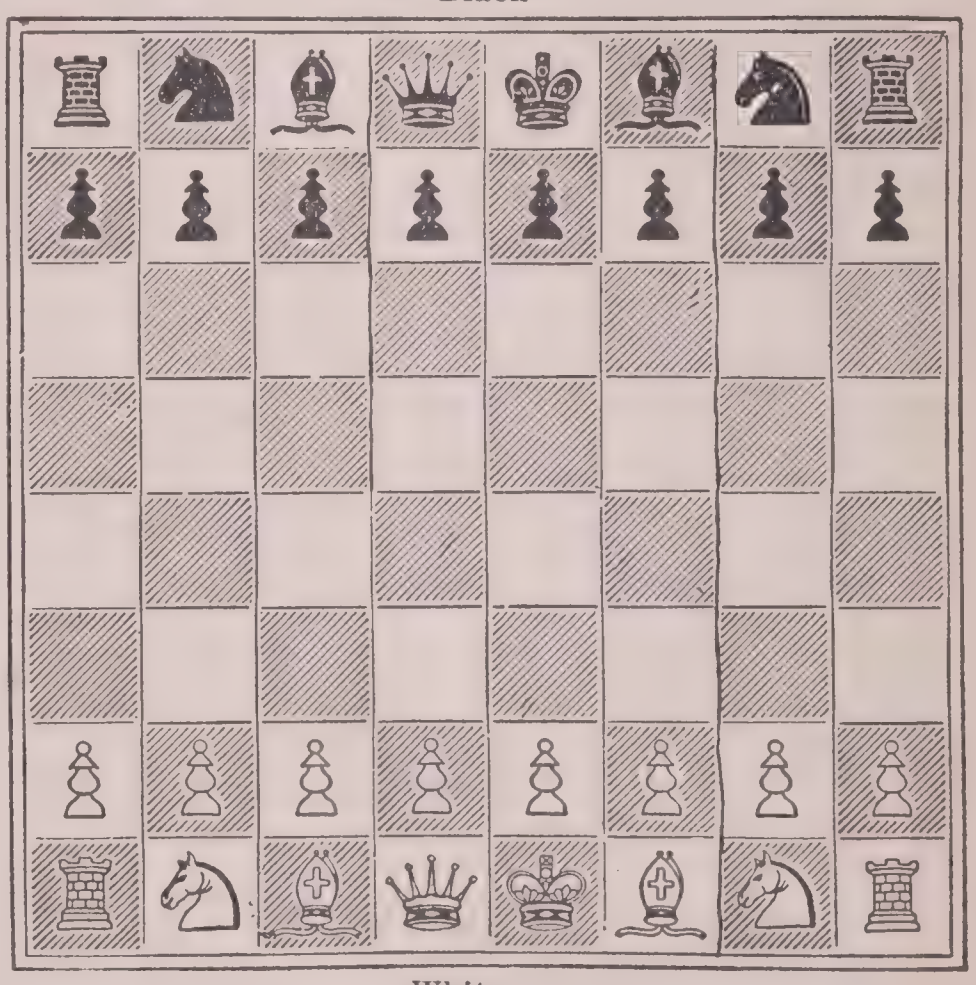
Cherusci (ke-rus′ci), an ancient German tribe whose territory probably was situated in that part of Germany lying between the Weser and the Elbe, and having the Harz Mountains on the north and the Sudetic range on the south. This tribe was known to the Romans before 50 B. C., and occasionally served in the Roman armies. But when Varus attempted to subject them to the Roman laws they formed a confederation with many smaller tribes, and having decoyed him into the forests, destroyed his whole army in a battle which lasted three days, and in which he himself was slain (A. D. 9). Upon this the Cherusci became the chief object of the attacks of the Romans. Germanicus marched against them, but though successful in several campaigns did not obtain any permanent advantages. Subsequently the Cherusci were overcome by the Chatti, and latterly they were incorporated among the Franks.

Ches′apeake Bay, a spacious bay of North America, in the states of Virginia and Maryland. Its entrance is between Cape Charles and Cape Henry, 16 mi. wide, and it extends 180 mi. to the northward. It is from 10 to 30 mi. broad, and at most places as much as 9 fathoms deep, affording many commodious harbors and a safe and easy navigation. It receives the Susquehanna, Potomac, and James rivers.

Cheshire (chesh′ir) (or Chester), a maritime county and county palatine of England, area 657,123 acres. Minerals abound, especially rock salt and coal, which are extensively worked. Cotton manufacture is carried on at Stockport, Stalybridge, and the north-eastern district, shipbuilding at Birkenhead and other places. Principal towns, Chester, the county town, Macclesfield, Stockport, Birkenhead, and Stalybridge. Pop. 730,052.

Chess, a well-known game of great antiquity and of Eastern origin, having probably arisen in India, and thence spread through Persia and Arabia to Europe. The name itself as well as many of the terms used in the game are clearly of Eastern origin. The game is played by two persons on a *board* which consists of sixty-four squares arranged in eight rows of eight squares each, alternately black and white. Each player has sixteen men, eight of which, known as *pawns*, are of the lowest grade; the other eight, called *pieces*, are of various grades. They are, on each side, *king* and *queen;* two *bishops*, two *knights*, and two *rooks* or *castles*. The board must be placed so that each player shall have a white square to his right hand. The men are then set upon the two rows of squares next the players; the pieces on the first, the pawns on the second row, leaving between each side four unoccupied rows The king and queen occupy the central squares facing the corresponding pieces on the opposite side. The queen always occupies her own color, white queen on white square, black on black. The two bishops occupy the squares next the king and queen; the two knights the squares next the bishops; the rooks the last or corner squares. The pawns fill indiscriminately the squares of the second or front row. The men standing on the king's or queen's side of the board are named respectively king's and queen's men. Thus king's bishop or knight is the bishop or knight on the side of the king. The pawns are named from the pieces in front of which they stand; king's pawn, king's knight's pawn, queen's rook's pawn, etc. The names of the men are contracted as follows: King, K.; King's

Black



White

Bishop, K. B.; King's Knight, K. Kt.; King's Rook, K. R.; Queen, Q.; Queen's Bishop, Q. B.; Queen's Knight, Q. Kt.; Queen's Rook, Q. R. The pawns are contracted; K. P., Q.P., K.B.P., Q.Kt.P., etc. The board is divided, inversely from the position of each player, into eight rows and eight files. Counting from White's right hand to his left, or from Black's left to his right, each file is named from the piece which occupies its first square, and counting inversely from the position of each player to that of the other, the rows are numbered from 1 to 8. At White's right hand corner we have thus K. R. square; immediately above this K. R. 2; and so on to K. R. 8, which completes the file; the second file begins with K. Kt. square on the first row, and ends with K. Kt. 8 on the eighth. White's K. R. 8 and K.Kt. 8 are thus Black's K. R. square and K. Kt. square, and the moves of each player are described throughout from his own position, in inverse order to the moves of his opponent.

In chess all the men capture by occupying

the position of the captured man, which is removed from the board. The ordinary move of the *Pawn* is straight forward in the same file; a pawn never moves backward. The first time a P. is moved it may be played forward one square or two; afterward only one square at a time. But in capturing an adverse piece the P. moves diagonally to occupy the position of the captured man. The player may choose any piece except the king, but the queen, the most valuable piece, is generally the piece chosen. This is called *queening* a pawn, and the player may thus have several queens on the board. *The Rook.*—The moves of the pieces are not, like those of the pawns, limited to a single direction. The R. moves in any direction and for any distance that is open along either the particular row or the file on which it happens to stand. It can, of course, capture any obstructing man and occupy its place. *The Bishop.*—The B.'s, like the R.'s, are unlimited in range, and move either backward or forward, but their direction is diagonal, and they can never change the color of their square. *The Queen.*—The Q. combines the moves of the R. and B. She is the most powerful piece on the board, and can move to, or capture at, any distance or direction in a straight line. *The King.*—The K. is at once the weakest and most valuable piece on the board. In point of direction he is as free as the queen, but for distance he is limited to the adjacent squares. Standing on any central square he commands the eight squares around him and no more. Besides his ordinary move the K. has another by special privilege, in which the R. participates. Once in the game, if the squares between K. and R. are clear, if neither K. nor R. has moved, if K. is not attacked by any hostile man, and if no hostile man commands the square over which K. has to pass, K. may move two squares towards either K.R. or Q.R., and R. in the same move may occupy the square over which K. has passed. This is called *castling. The Knight.*—The Kt., unlike the other pieces, never moves in a straight line. His move is limited to two squares at a time, one forward or backward, and one diagonally, and he can leap over any man occupying a square intermediate to that to which he intends to go. The Kt., like the K., when on a central square commands eight squares, but they are at two squares' distance, and all in an oblique direction. All captures in chess are optional.

The definite aim in chess is the reduction to surrender of the opposing king. The K. in chess is supposed to be inviolable, that is, he cannot be taken, he can only be in such a position that if it were any other piece it would be taken. Notice of every direct attack upon him must be given by the adversary saying *check*, and when the K. is attacked all other plans must be abandoned, and all other men sacrificed, if necessary, to remove him from danger, cover the attack, or capture the assailant. It is also a fundamental rule of the game that the K. cannot be moved into check. When the K. can no longer be defended on being checked by the adversary, either by moving him out of danger, or by interposing, or by capture, the game is lost, and the adversary announces this by saying *checkmate.* When, by inadvertence or want of skill, the player having the superior force blocks up his opponent's K. so that he cannot move without going into check, and no other man can be moved without exposing him, the player, reduced to this extremity, cannot, without violating the fundamental rule referred to, play at all. In such a case, the one player being unable to play and the other out of turn, the game is considered *drawn*, that is, concluded without advantage to either player. The laws of the game must be sought in some special manual. Perhaps the best code is that given in Staunton's *Chess Praxis.*

Chester, an English borough, county town of Cheshire, situated on the Dee, about 16 mi. from Liverpool. It is a bishop's see, and contains an old and interesting cathedral recently restored. Chester has manufactories of lead pipes, boots and shoes, iron foundries, chemical works, etc.

Chester, Delaware co., Pa., on Delaware River, 13½ mi. s. of Philadelphia. Railroads: P. W. & B.; B. & O.; P. & R. Industries: shipyards, iron foundry, woolen mills and cotton mills, steel cos., dye-wood mill, brick yards, planing and sash mills, box and other factories. Surrounding country agricultural and quarries. The town was first settled in 1644, and in 1699 William Penn chartered borough of Chester. It became a city in 1866. Pop. 1900, 33,988.

Chesterfield, a town of Derbyshire, England. The principal manufactures are ginghams, lace, and earthenware, but a majority of the working classes are employed in connection with the collieries, iron mines, and blast furnaces of the vicinity. Pop. 13,242.

Chesterfield, Philip Dormer Stanhope, Earl of (1694–1773), an English statesman and author. He succeeded his father in the title in 1726, sat in the House of Lords, and acquired some distinction as a speaker. In 1728 he was ambassador to Holland, in 1744 lord lieutenant of Ireland, a position which he occupied with great credit, and in 1746 secretary of state; but in 1748 retired from public affairs. His letters to his godson with a memoir by the Earl of Carnarvon were published in 1889. These writings combine wit and good sense with great knowledge of society.

Chestnut (or Chesnut), a genus of plants, allied to the beech. The common or Spanish chestnut is a stately tree, with large, handsome, serrated, dark-green leaves. The fruit consists of two or more seeds enveloped in a prickly husk. Probably a native of Asia Minor, it has long been naturalized in Europe, and was perhaps introduced into Britain by the Romans. The tree grows freely in U. S., and may reach the age of many centuries. Its fruit ripens only in some cases. Chestnuts form a staple article of food among the peasants of Spain and Italy. The timber of the tree was formerly more in use than it is now;

it is inferior to that of the oak, though very similar to it in appearance, especially when old. Two American species of chestnuts have edible fruits. The former is often regarded as identical with the European tree. The name of Cape Chestnut is given to a beautiful tree of the rue family, a native of Cape Colony. The Moreton Bay Chestnut is a leguminous tree of Australia, with fruits resembling those of the chestnut. The water-chestnut is the water

Branchlet, with Catkins, of Common Chestnut (*Castanea vulgaris*). *a.*—fruit; *b.*—seed.

caltrop. The horse-chestnut is quite a different tree from the common chestnut.

Chettik (chet′tik), a tree of Java, yielding a very virulent poison called by the same name, more powerful than that obtained from the upas tree, and owing its virulence to the strychnine it contains.

Chevalier (chė-vâ-lya), Michel (1806–1879), a noted French economist. He became a councilor of state (1838), professor of political economy in the Collége de France (1840), member of the Chamber of Deputies (1846), and member of the Institute (1851). By this time he had written a number of works: *Lettres sur l'Amerique du Nord; Des Intérêts Matériels en France; Essais de Politique Industrielle; Cours d' Economie Politique, etc.* He was known as a strong advocate of free trade, and as a specialist on questions of currency. Along with Cobden and Bright he had a great part in the commercial treaty of 1860 between France and Britain.

Che′viot Hills, a range on the borders of England and Scotland, stretching s.w. to n.e. for above 35 mi.; culminating point, the Cheviot, 2,688 ft.

Cheviot Sheep, a variety of sheep, taking their name from the well-known Border

mountain range, noted for their large carcass and valuable wool, which qualities, combined with a hardiness second only to that of the black-faced breed, constitute them the most valuable race of mountain sheep in the kingdom. The fleece weighs from 3 to 4 lbs., and the carcass of ewes varies from 12 to 16 lbs. per quarter, that of wethers from 16 to 20 lbs,

Chevreul (she-vreul), Michel Eugene (1786–1889), a French chemist. In 1813 he became professor of physical science in the Charlemagne Lyceum, in 1824 director of dyeing in the Gobelins manufactory, in 1830 professor of chemistry in the Collége de France. In 1879 he retired. He has written various works on chemistry and dyeing, and an important work on the *Principles of Harmony and Contrast of Colors*, translated into English.

Cheyenne, Laramie co., Wyo., on Crow Creek. It is the center of the great beef-growing region, and the shipping point for cattle to eastern markets. Railroads: U. P.; Denver Pacific & Colo. Central; Cheyenne & Burlington; and others. Principal industries: railroad machine and repair shops, breweries, book-binderies, saddle and harness, carriage and wagon, woodwork and cigar factories. Near the city are a number of more or less noted silver mines. Pop. 1900, 14,087.

Chiapas (chi-ä′pâs), a state of the Mexican Confederation; area 16,048 sq. mi. It is in many parts mountainous, is intersected by several considerable streams, and covered with immense forests. The valleys are fertile, and produce much maize, sugar, cacao, and cotton, etc. But trade is quite undeveloped on account of the lack of roads. The capital is San Cristobal. Pop. 209,362.

Chica (chē′ka), a red coloring matter which the Indians on the upper parts of the Orinoco and the Rio Negro prepare from the leaves of a plant native to that region called *Bignonia Chica*, and with which they paint their skin, in order to be better able to resist the rays of the sun.

Chica (chē′kå), a kind of beer made from maize, in general use in Chile, Peru, and elsewhere in the mountainous regions of South America. The usual method of preparing it is to steep the maize till it begins to grow, when it is exposed to dry in the sun. The malt thus prepared is then ground, mixed with warm water and left to ferment. The beer, when ready, has a dark yellow color, and a pleasant and somewhat bitter and sour taste, and is very intoxicating. Sometimes the Indians instead of grinding the malt chew it, and this variety of the liquor is considered the best. It is the national drink of the Indians, and consumed by them in great quantities.

Chicago, Cook co., Ill., metropolis of the Northwest, situated at the foot of Lake Michigan, extending from Evanston on the north to the Indiana State Line on the south. The site was visited by Père Marquette in 1673. Fort Dearborn was built there in 1804, and evacuated in 1812, on the occasion of the memorable massacre by the Indians, and re-

Chicago

built in 1816. For many years Chicago was the leading Indian trading post in the West. In 1833 the inhabitants, who had been for a number of years gathering there, organized a village board, and by 1835 the population had reached 3,265. A city charter was obtained in 1837, and William B. Ogden was elected the first mayor, 709 votes being cast. The commerce of the great lakes grew enormously, and, together with the construction of the Illinois and Michigan Canal, gave the young city its first impetus. Thus far it had progressed in its career without the aid of railroads. But by the year 1850 about 30 mi. of the Galena & Chicago Union Railroad (the present Chicago & Northwestern) had been built, and the population had bounded up to 20,000. The first railway from the East to enter the city was the Lake Shore & Michigan Southern in 1852. Since that period the railway system, of which Chicago is the center, has developed into colossal proportions, so that in 1897 the number of railways centering in or directly tributary to Chicago, were as follows:

Eastern: Baltimore & Ohio; Chicago & Erie; Chicago & Eastern Illinois; Chicago & Grand Trunk; Chicago & West Michigan; Cleveland, Cincinnati, Chicago & St. Louis; Elgin, Joliet & Eastern; Grand Trunk; Louisville, New Albany & Chicago; Lake Shore & Michigan Southern; Michigan Central; New York, Chicago & St. Louis; Pennsylvania System; Pennsylvania Company.

Western: Atchison, Topeka & Santa Fé; Burlington, Cedar Rapids & Northern; Canadian Pacific; Chicago & Alton; Chicago, Milwaukee & St. Paul; Chicago & Northwestern; Chicago, St. Paul, Minneapolis & Omaha; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific; Chicago Great Western; Duluth & Iron Range; Great Northern; Illinois Central; Keokuk & Western; Missouri, Kansas & Texas; Minneapolis & St. Louis; Northern Pacific; Quincy, Omaha & Kansas City; St. Paul & Duluth; Sioux City & Pacific; Wabash; Wisconsin Central lines.

Chicago is the greatest grain center of the world. During the year 1899 the receipts of grain, and of flour in its grain equivalent, aggregated 301,271,723 bushels. The receipts of live stock during the year comprised 14,094,918 head, aggregating $187,745,655. The great Union Stock Yards constitute a noted feature of the city, comprising as they do 345 acres, and the cost of the structures being over $3,000,000.

On Oct. 8, 9, and 10, 1871, Chicago was visited with the greatest conflagration known in the annals of the world, 2,100 acres having been burned over, and property destroyed to the amount of $190,000,000, but in less than a decade after this great calamity the metropolis had thoroughly recuperated from the loss.

A notable feature in the history of Chicago was the anarchist riot in 1886, during which a bomb thrown at a meeting of anarchists into a platoon of policemen killed or injured many of the latter. After an exciting trial in which the whole country took a deep interest, a number of the anarchists were condemned to death and subsequently executed.

The park system of Chicago, established by the state legislature in 1869, has scarcely a parallel in America, whether as regards extent of area or ornamentation of grounds. The length of the boulevards, some of them 200 ft. wide, amounts to nearly 60 mi., and new additions are constantly being made to their extent.

The manufactures of the city include nearly every variety of production; but those of, together with the trade in, lumber and iron, should be especially mentioned. The greatest industry of the city, however, is pork and beef packing, which surpasses that of any other city in the world. The number of persons employed in all manufacturing industries in the city in 1896 was 152,806.

A feature of Chicago destined to add vastly to its fame is the colossal Sanitary or Drainage Canal, extending from Chicago to Joliet, which was finished in 1899. This great work turns the waters of Lake Michigan south into the Kankakee and Illinois rivers, and the width is made 200 ft., with an average depth of 20 ft., with the design of having it eventually used as a part of a ship canal to the Mississippi River. For full description, See *Canal, Chicago Drainage.*

The city of Chicago covers an area of 187 sq. mi., and has 2,570 mi. of streets and alleys. The fire department is efficiently organized, with 86 steam engines, 4 fire-boats, 27 chemical engines, 42 hose wagons, 33 hook-and-ladder trucks, 53 chemical extinguishers, and 68 portable pumps.

Its river, with its three branches, is spanned by 33 bridges. It has 20 theaters, 25 orphan asylums, 7 hospitals, and 290 churches.

There are in Chicago 38 daily publications of all kinds, 280 weekly publications, 56 semimonthly, 319 monthly, and 42 quarterly. 700,000,000 copies of all descriptions of publications were issued in the city in 1900

Perhaps no city in the Union is more generously provided with public libraries than Chicago. The Chicago Public Library has 220,000 volumes; the Newberry Library (endowed with $2,141,201) 145,000 choice and rare volumes, mainly for reference; and the John Crerar Library recently opened (with an endowment fund of $2,500,000) has now between 30,000 and 40,000 volumes, and the number will be rapidly increased. The city has several great educational and theological institutions, among which the most prominent is the University of Chicago endowed with $7,000,000.

The population of Chicago, according to a school census taken in 1896, was 1,619,226. According to the census of 1900 it was 1,698,575.

The following are the mayors of Chicago since the first charter election in 1837: William B. Ogden, 1837–1838; Buckner S. Morris, 1838–39; Benjamin W. Raymond, 1839–40; Alexander Lloyd, 1840–41; Francis C. Sherman, 1841–42; Benjamin W. Raymond, 1842-43; Augustus Garrett, 1843–44; A. S. Sherman, 1844–45; Augustus Garrett, 1845–46; John P.

Chapin, 1846–47; James Curtiss, 1847–48; James H. Woodworth, 1848–50; James Curtiss, 1850–51; Walter S. Gurnee, 1851–53; Charles M. Gray, 1853–54; Isaac L. Milliken, 1854–55; Levi D. Boone, 1855–56; Thomas Dyer, 1856–57; John Wentworth, 1857–58; John C. Haynes, 1858–60; John Wentworth, 1860–61; Julian S. Rumsey; 1861–62; Francis C. Sherman, 1862–65; John B. Rice, 1865–69; Roswell B. Mason, 1869–71; Joseph Medill, 1871–73; Harvey D. Colvin, 1873–76; Monroe Heath, 1876–79; Carter H. Harrison, 1879–87; John A. Roche, 1887–89; Dewitt C. Cregier, 1889–91; Hempstead Washburne, 1891–93; Carter H. Harrison (assassinated) 1893; George B. Swift, 1893; John P. Hopkins, 1893–94; George B. Swift, 1894–97; C. H. Harrison, Jr., 1897–1903.

Chicago, UNIVERSITY OF, was first founded in 1857 by the Baptist Society of Chicago. Its doors were closed in 1886 owing to lack of funds. The present university was founded by John D. Rockefeller who started the endowment fund with $600,000. Later he added $4,500,000 besides erecting two dormitories. William Rainey Harper was called in 1891 to the presidency of the new institution, and the first lectures were given in October, 1892. The year is divided into four quarters, each continuing twelve weeks, with a recess of one week between. The annual income is $1,860,000; students, 2,503; instructors, 210; buildings, 23; books, 350,000.

Chickahom'iny, a river in Virginia, rising about 20 mi. n.w. of Richmond, flowing s.e. till it joins the James River. Near this river many important battles during the Civil War took place—the battle of Williamsburg, of the Seven Pines, of Gaines's Mill, etc.

Chickamau'ga, a small tributary of the Tennessee River, where a battle took place Sept. 19–20, 1863, between the Federal troops under Rosecrans and the Confederates under Bragg and Longstreet, the latter gaining the victory.

Chick'asaw Indians, a tribe of American Indians of the Appalachian nation. In 1833 they gave up to the U. S. the last of their lands south of the Tennessee River, receiving as compensation a money indemnity and new lands on the left bank of the Red River, in the Indian Territory. The Chickasaws number about 8,000. They have made considerable advances toward civilization, have a senate, house of representatives, and more than a million dollars in deposit with the Union government.

Chickering, JONAS (1797–1853), American manufacturer. He received a common school education and was apprenticed to a cabinet maker. In 1818 he went to Boston and took a position with a pianoforte maker. In 1823 he set up for himself, in a small way, as a manufacturer of pianos. This business became greatly extended, until he furnished annually about 2,000 instruments. In 1852 his factory was burned, and before the new one had been completed he died. He made many valuable improvements and for many years was the leading maker of pianos both in this country and Europe.

Chicla'na, a town, Spain, Andalusia, 12 mi. s.e. Cadiz, built of snow-white stone, contains a magnificent hospital, and has manufactures of linen, earthenware, etc. The sulphur baths, temperature 60°, are efficacious in cutaneous affections, and are much frequented. Pop. 11,627.

Chico, Butte co., Cal., near Sacramento River, 100 mi. n. of Sacramento. Railroad, S. P. O. & C., running from San Francisco to Portland. Industries: lumber mill, flour mill, and iron foundry. Coal, oil, and gas in vicinity. Surrounding country agricultural and mineral. The town was first settled in 1850 and became a city in 1870. Population 1900, 2,640.

Chicopee, Hampden co., Mass., on left bank of Connecticut and mouth of Chicopee River, 95 mi. w.s.w. of Boston. Railroad, Connecticut River. The industries embrace cotton mills, manufacture of agricultural implements, knitting mills, bicycle and rifle factories, large bleachery, machinery, and bronze statuary, brass foundries, bobbin and reel factories. Pop. 1900, 19,167.

Chic'ory, a genus of composite plants. The leaves are sometimes blanched, to be used as salad. But the most important part of the plant is its long, fleshy, and milky root, which when roasted and ground is now extensively used for mixing with coffee. Its presence among coffee may easily be detected by putting a spoonful of the mixture into a glass of clear cold water, when the coffee will float on the surface, and the chicory separate and discolor the water as it subsides.

Chicory. *a.*—single flower; *b.*—separate floret.

Chiem-See (*h*ēm'zā), a lake in southeastern Bavaria, 48 mi. s.e. Munich; greatest length 10 mi., greatest breadth 9 mi. Its scenery is beautiful, and it contains three pretty islands.

Chieti (ki-ā'tē), a town, Southern Italy, capital of province of same name. It is well built, and has manufactures of woolens, etc. Pop. 12,273.

Chigoe (chig'ē) (or Jigger), a very curious insect closely resembling the common flea, but of more minute size, found in the West Indies and South America, and in parts of the U. S. It burrows beneath the skin of the foot, and soon acquires the size of a pea, its abdomen becoming distended with eggs. If these eggs remain to be hatched beneath the skin great

irritation and even troublesome sores are sure to result.

Chigoe. *a.*—male, *b.*—gravid female.

Chih-le (chi-lē′) (or Pe-chi-le), one of the northern provinces of China, watered by the Pei-ho, containing Peking the imperial capital. Area about 59,000 sq. mi.; pop. 18,000,000.

Chihuahua (chē-wä-wä), a city of Mexico, capital of the state of the same name, generally well built, and supplied with water by a notable aqueduct. It is surrounded by silver mines, and is an important entrepôt of trade. Pop. 12,000. The state is bounded on the n. by the U. S. and on the n.e. by the Rio Grande del Norte; has a healthy climate, and is rich in silver mines. Pop. 225,941.

Child, Lydia Maria (1802–1880), American author; was educated in common schools. She taught for one year in a seminary in Medford, Mass., and kept a private school in Watertown from 1824 till 1828, when she was married to David Lee Child. She became early interested in the antislavery movement and published *An Appeal to that Class of Americans Called Africans*, which was the first antislavery work printed in America in book form. In 1841 she removed to New York where she was editor of the *National Antislavery Standard* until 1843. She contributed largely to aid the Union soldiers during the Civil War, and afterward helped the freedmen and gave lavishly for the support of schools for the negroes. Her antislavery writings contributed greatly to the formation of public sentiment.

Childebert, the name of three kings of the Merovingian dynasty, France (495–711). The last, Childebert III, was one of those Merovingian kings, who, from their incapacity, received the appellation of *rois fainéants* or *sluggard kings.*

Childs, George William (1829–1894), American public man and philanthropist. He was long identified with the *Philadelphia Ledger* which he made most successful, was a heavy contributor to charities and erected many stained glass windows to celebrities. In 1890 he published his *Recollections.*

Chile (or Chili) (chē′lā, chē′lē), a country of South America, extending along the Pacific Coast from lat. 18° south nearly to Cape Horn, and including Chiloé and many other islands and part of Terra del Fuego. It is bounded on the n. by Peru, on the n. e. and e. by Bolivia and the Argentine Republic, from which it is separated by the chief range of the Cordilleras. Its length from north to south is about 2,400 mi.; its breadth, on an average, 120 mi.; area 293,310 sq. mi., divided into a number of provinces and territories; pop. (1890)

2,665,926. By the war with Peru and Bolivia which terminated in 1882 Chile gained all the seaboard of Bolivia, and annexed also the Peruvian provinces of Tarapacá and Tacna (the latter for ten years, after which a plebiscite is to decide whether it shall go to Chile or Peru). The chief towns are Santiago, or St. Jago (the capital) and Valparaiso. The rivers are numerous, but small, and have generally rapid currents; the principal are the Biobio, the Valdivia, Lontue, Maule, Itata, and Chuapa or Illapel. The surface is greatly diversified. Some of the summits rise to 20,000 ft. or more, but the elevation decreases toward the south. Chiloé and numerous other islands fringe the coast in the south. Earthquakes are common, those of 1822, 1835, and 1868 being particularly violent. In the Chilean Andes there are twenty volcanoes at least, three of which (Antuco, Villarica, and Osorno) are still active. The climate is remarkably salubrious. In the northern provinces it rarely rains—in some parts perhaps never; in the central parts rain is sufficiently abundant, while in the extreme south there is even an excess of moisture. Among the minerals of Chile are gold, silver, copper, lead, iron, zinc, antimony, manganese, arsenic, tin, sulphur, alum, salt, and cubic niter. Silver and copper are the two most important metals. The copper mines are most numerous in the northern districts. The cubic niter, or Chile saltpeter, is a great source of wealth. Coal is wrought at several places. Though possessing many fertile tracts, a great portion of Chile is incapable of cultivation, being naked and mountainous. In some of the northern districts maize is cultivated; in the southern districts wheat and barley are the chief agricultural products. Fruits are abundant—apples, pears, apricots. peaches, figs, grapes, oranges, watermelons, etc. The spread of European plants has been so great in some places as to crowd out native species, and cultivation is rapidly carrying this farther. The wild animals include the guanaco, puma, or American lion, the chinchilla, coypu, deer, etc. Cattle are raised in great numbers, from 4,000 to 20,000 being sometimes reared on one farm. The manufactures are of little importance, but include cordage, soap, copper wares, leather, brandy, etc. The commerce is increasing rapidly. Mineral products form five sixths of the total exports, the principal article being cubic niter (or Chile saltpeter). Next come copper, iodine, wheat, silver, etc. Accounts are in pesos or dollars, the silver peso having the value of 77 cents. There are about 1,600 mi. of railway. A line is in progress to cross the Andes into the Argentine Republic.

Chile is a republic, and is considered the best regulated in South America. It is under a president elected for five years and a council of state. The legislature is composed of a senate elected for six years, and a house of deputies elected for three years. The army numbers about 7,000 men; the chief vessels of the navy are three ironclads and one protected cruiser. The Chileans are mostly of Spanish or Indian descent. Schools and colleges have been es-

tablished. The Roman Catholic is the established religion of Chile, but the members of other denominations are allowed to erect edifices in which to worship. The part of Chile lying south of the River Biobio is inhabited chiefly by Indians. The Araucanians inhabit the region lying between the rivers Biobio and Valdivia, and long maintained their independence, till in 1882 they became subjects of the Chilean government.

Chile originally belonged to the Incas of Peru, from whom it was wrested by the Spaniards under Pizarro and Almagro in 1535. From this period Chile continued a colony of Spain till 1810, when a revolution commenced, which terminated in 1817 in the independence of Chile. A war begun with Spain in 1865 led to the blockade of the coast by the Spanish fleet, and the bombardment of Valparaiso in 1866. In 1879 a war broke out with Bolivia and Peru, in reference to the rights of Chile in the mineral district of Atacama. This war was virtually finished in 1881, and the victorious Chileans gained a large accession of territory from both Bolivia and Peru. In 1891 an insurrection, headed by influential members of congress, caused by dissatisfaction with President Balmaceda's administration, was successful, and resulted in his overthrow. Later in the same year he committed suicide. After the close of the civil war Señor Errazuriz was elected president of the Republic, June 25, 1896.

Chilled Iron, iron cast in metal molds called *chills*, where, on account of the rapid conducting of the heat, the iron cools more quickly on the surface than it would do if cast in sand. Chilled iron is whiter and has a harder surface than iron cast in any other way.

Chillicothe, Livingston co., Mo., 75 mi. e. of Kansas City. Railroads: Hannibal & St. Jo; C. M. & St. P.; and Wabash. Industries: railroad round houses, and machine shops, furniture factory, foundry, 3 flouring mills and 3 cigar factories. Surrounding country is agricultural. The town was first settled in 1835 and became a city in 1845. Pop. 1900, 6,905.

Chillicothe, Ross co., O., on right bank of Scioto River, 50 mi. s. of Columbus. Railroad, C. W. & B. Principal industries: flouring and paper mills, shoe and furniture factories, carriage, and wagon, and farm implement works. The town was founded in 1796 and is pleasantly situated in a valley surrounded by hills nearly 500 ft. high. Population, 1900, 12,976.

Chillon (shē-yōn̤), a castle, Switzerland, on the Lake of Geneva, 6½ mi. s.e. of Vevay, once an important stronghold of the Counts of Savoy, and the prison house of Francis Bonnivard, prior of St. Victor, Geneva, from 1530 to 1536. It has acquired interest from Byron's poem, *The Prisoner of Chillon.*

Chiloé (chēl-wā′), a province and island of Chile. The province comprehends the island of Chiloé, together with a number of other islands, and a portion of the mainland. The island of Chiloé is for the most part covered

with dense forests, but large tracts of it are still unexplored. The chief town is San Carlos, or Ancud. The exports consist chiefly of timber from the forests of the island and the mainland. The climate is healthy but very wet. Area of the province, 30,981 sq. mi; pop. 71,388.

Chilon (kī′lon) (or Chilo), one of the so-called seven wise men of Greece. He flourished about the beginning of the sixth century B.C., and was a native of Sparta, and one of the Ephori, or chief magistrates. A collection of his sayings is extant.

Chimæra (Chimera) (ki-mē′ra), in classical mythology, a fire-breathing monster, the foreparts of whose body were those of a lion, the middle of a goat, and the hinder of a dragon. Thus the name came to be used for an unnatural production of the fancy.

Chimbora′zo, a mountain of Ecuador, in the province of Quito, about 90 mi. s. by w. of Quito. Though not the loftiest summit of the Andes, it rises to the height of 20,703 ft. above the level of the sea, and is covered with perpetual snow 2,600 feet from the summit and upward. In 1880 it was ascended to the top for the first time by E. Whymper.

Chimes, a species of music, mechanically produced by the strokes of hammers against a series of bells, tuned agreeably to a given musical scale. The hammers are lifted by levers acted upon by metallic pins, or wooden pegs, stuck into a large barrel, which is made to revolve by clock-work, and is so connected with the striking part of the clock mechanism that it is set in motion by it at certain intervals of time, usually every hour, or every quarter of an hour. The chime mechanism is sometimes so constructed that it may be played like a piano, but with the fist instead of the fingers.

Chim′ney, an erection generally of stone or brick containing a passage by which the smoke of a fire or furnace escapes to the open air. In this sense the first chimneys we hear of are no earlier than the Middle Ages. The longer a chimney is the more perfect is its draught, provided the fire is great enough to heat the column of air in it, because the tendency of the smoke to draw upward is in proportion to the difference of weight between the heated air in a chimney and an equal column of external air.

Chimpan′zee, the native Guinea name of a large West and Central African ape belonging to the anthropoid or man-like monkeys, and to the same genus as the gorilla. When full grown it is sometimes about 5 ft. high, with black hair, and is not so large and powerful as the gorilla. Like the orang it has the hair on its forearm turned backward, but differs from it in having an additional dorsal vertebra and a thirteenth pair of ribs. It walks erect better than most of the apes. It feeds on fruits, often robs the gardens of the natives, and constructs a sort of nest among the branches. It is common in menageries, where it shows much intelligence and docility.

China, an immense empire stretching from the center of Asia for 3,000 mi. to the east

coast of Korea, and from the Siberian frontier at the river Amoor for 2,400 mi. southward to the island of Hainan. The vast empire, second in magnitude only to that of Russia and Great Britain, has an area of about 4,500,000 sq. mi., and a population variously estimated at 300,000,000, 400,000,000, or more, and is usually divided into China Proper and the dependencies Manchuria, Mongolia, Eastern Turkestan, Dzoungaria, and Thibet, of which Thibet is practically autonomous, although controlled in its foreign relations by the Chinese government. Korea acknowledges the suzerainty of China, but hardly forms part of the empire. The dependencies, though they cover more than 3,000,000 sq. mi., contain but a small and relatively unimportant part of the population (about 30,000,000), China Proper being the center of power and population.

China Proper, known to Marco Polo and earlier travelers by the Tartar name of *Cathay*, called "Middle Kingdom" by the Chinese,

Chimpanzee.

comprises the following provinces: Chihle, Shantung, Shansi, Honan, Kiangsu, Nganhwuy, Kiangsi, Chekiang, Fukien, Hupeh, Hunan, Shensi, Kansu, Szechuen, Kwantung, Kwangsi, Yunnan, Queichow. The total extent is about 1,554,000 sq. mi. Peking is the capital. There are many large and populous cities.

Physical Features.—Great part of the country is not well known. The coast line forms an irregular curve of about 2,500 miles. It is not deeply penetrated by gulfs, the only one of great extent being that of Pe-che-le in the northeast, but numerous indentations of sufficient dimensions to form safe and capacious roadsteads are found in every quarter. It is characterized by a fringe of islands and islets, the largest of which are Formosa and Hainan. The Gulf of Pe-che-le, the Yellow Sea, and the China Sea wash the eastern and southeastern shores, and are characterized by destructive

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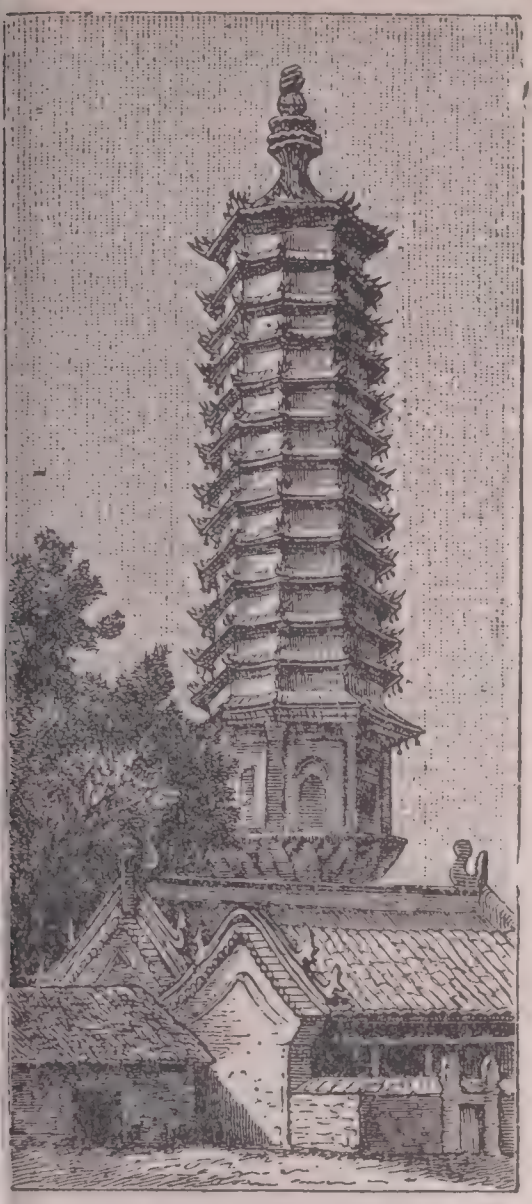
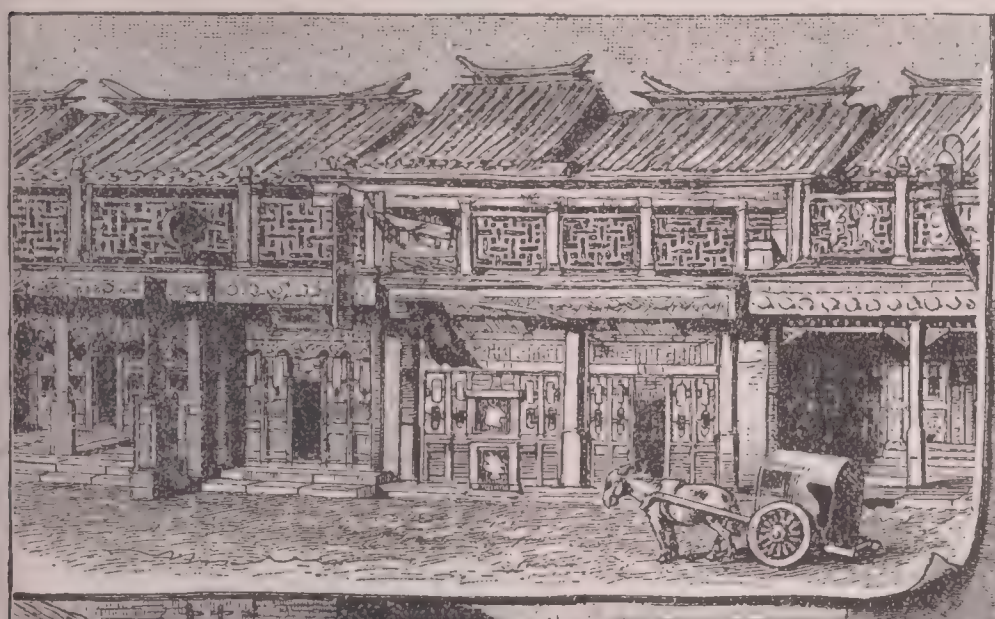
storms. The inland boundaries are formed mainly by Tonquin, Burmah, Thibet, and, on the north, partly by the Great Wall separating China from Mongolia, one of the most remarkable of human structures, being an artificial barrier 1,500 mi. long. Two thirds of the interior are estimated to be mountainous. The general slope is from west to east, and the mountains are a continuation of those of Thibet and Central Asia. The great Kuen-lun range throws off branches, the Tsing-Ling, Fu-niu-shan, and Mu-ling, which, running eastward between the great valleys of the Hoang-Ho and Yang-tse-kiang, traverse almost the whole breadth of China. Farther north the Nan-shan branch of the Kuen-lun range runs under various names (Kuliang, Alashan, Inshan, etc.) along the northeast of China till it reaches the frontier of Manchuria, north of Peking. The third great mountain system of China is in the southeast, where extensive chains such as the Nanshan, the Ta-yu-ling, and Pu-ling stretch on the south side of the Yang-tse-kiang all the way from the highlands of Yunnan to the eastern seaboard. Between these mountain systems, and following courses which may be roughly described as parallel, run the two great rivers of China, the Hoang-Ho and the Yang-tse-kiang. Here lie the central aud richest provinces of China. On both sides of the lower Hoang-Ho is an immense delta plain, consisting generally of a deep alluvial soil of unparalleled fertility. As they approach the seacoast the two rivers are connected by the Grand Canal, 700 miles in length, thus completing a magnificent system of inland navigation. The Hoang-Ho has changed its lower course several times, and is subject to tremendous and disastrous floods. Besides these rivers and their numerous tributaries, the most deserving of notice are the Se-kiang in the south, of considerable size, but still more commercial importance, having at or near its embouchere Canton, Hong-Kong, and Maceo; and the Pei-ho, which, though much smaller, forms a waterway between Peking and the gulf of Pe-che-le. There are a number of lakes, mostly of no great size; the largest is Tung-ting, near the center of China. A remarkable feature of the surface of Northern China is the deposit of *loess*, a brownish yellow earth of great fertility, which covers an immense area both of mountain and valley, and enables agriculture to be successfully carried to the height 7,000 or 8,000 ft.

Climate.—The greater part of China belongs to the temperate zone, but it has what is called an excessive climate, At Peking in summer the heat ranges from 90° to 100° in the shade, while the winter is so cold that the rivers are usually frozen from December to March. At Shanghai the maximum temperature reaches 100°, and the minimum falls at least to 20° below freezing point (12° F.). In the south the climate is of a tropical character, the summer heat rising to 120°. Here the southwest and northeast monsoons blow with great regularity, and divide the year between them. Among the greatest scourges of the country are the dread-

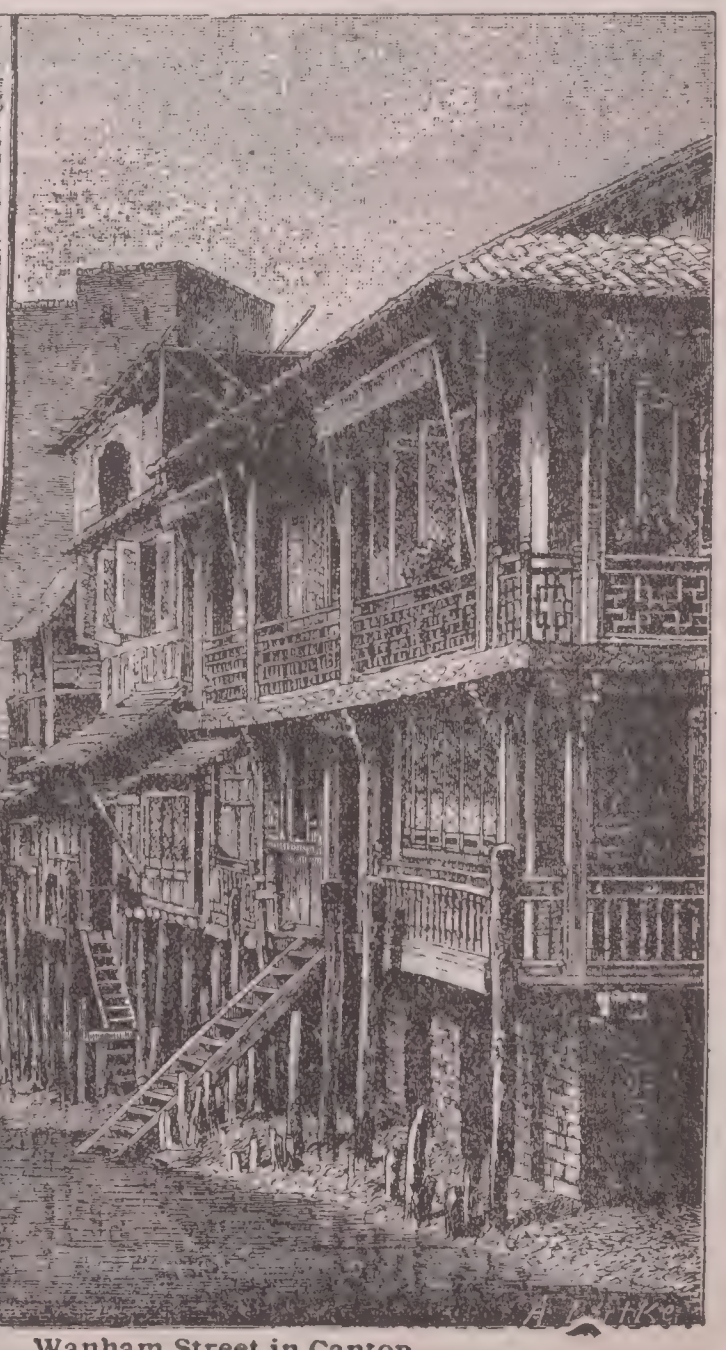


1. Pagoda, or Heathen Temple,

2. Door of Temple in Tien-tsin.



3. Street View in Peking.



4. Wanham Street in Canton.

1. Bronze Vessel for Sacrificial Services. 2. Similar Vessel. 3. Flat Vase of Naphrite. 4. Altar Candlestick. 5. Vessels for Incense of Zinc. 6. Rhinoceros Cup. 7. Sceptre of Nephrite. 8. Human Figure of Soapstone. 9. Lao-tze Riding on a Buffalo (Bronze). 10. Vaze of Tea-colored Bronze. 11. Phantastic Figure Carved out of Bamboo Root.

ful gales known as typhoons, from the Chinese Ta-fung, or "great wind." They never fail to commit great devastation, though happily they always give such timely notice of their approach that preparations can be made. The Hoang-Ho and Yang-tse-kiang basins have a pretty equable temperature, due to the soft moist winds of the Pacific.

Productions.—China is well supplied with minerals, including gold, silver, copper, iron, and other metals, and there are very extensive coal fields, though the quantity raised from them is comparatively small. Salt is abundant, and there are inexhaustible beds of kaolin, or porcelain earth. Among animals it is difficult to mention any that are characteristic of the country; many of them are identical with or differ but little from those of Europe. In the south and southwest the tiger, the rhinoceros, and elephant are found; bears are common in many parts; other carnivora are the wild cat, badger, lynx, marten, etc. Camels and elephants are used in a domestic state, but the chief domesticated animal is the buffalo. The horses are of a poor breed. Among birds the most beautiful are the gold and silver pheasants. Fish swarm in all inland waters as well as on the coast, the natural supply being immensely increased by artificial means. As regards the flora of China, it is tropical in the south (coco and sago palms, banana, pandanus, etc.), sub-tropical farther north, and still farther north prevails a number of plants and trees identical with or closely akin to those of middle Europe. Flowering plants, shrubs, and trees are so exceedingly abundant as to form a feature. The bamboo, from the immense number of uses to which it is put, is one of the most valuable of trees. Oaks, the chestnut, hazel, pines, yew, walnut, etc., are among forest trees. Wax and camphor trees abound. Azaleas are exceedingly numerous; other flowering plants are the camellia rose, passion flower, cactus, lagerstrœmia, etc. Fruits are abundant and varied. The soil, especially of the country comprising the two great river basins, is extremely fertile, and agriculture has always been held in high veneration in China. Rice, as the principal food of the people, is the staple crop. The rich alluvial plains which cover a great part of the surface are admirably adapted for its culture, and by careful management yield amazing crops. In the north there is a variety called dry-soil rice, which is cultivated like any other cereal. Wheat, barley, and millet are the other chief grain crops. Other crops are maize, buckwheat, a great variety of beans, peas, and pulse generally, sugar cane, tobacco, and vegetables in endless variety, including potatoes, turnips, etc., and at the ports the best European and American vegetables. Varieties of the cabbage tribe are extensively cultivated for the oil extracted from the seeds. Three plants of the greatest economical importance to China are the mulberry, cultivated to provide food for silkworms, cotton, and tea, the last for long regarded as exclusively a Chinese product. Another important crop is the opium poppy, which is extensively grown, though the product is inferior to that of India.

China

Manufactures.—In arts and industry the Chinese have made considerable progress. One peculiar feature in their processes is the general absence of machinery, and the preponderance of manual labor. Among the chief industries is the silk manufacture, which produces some varieties of stuffs unsurpassed anywhere. Everybody wears silks; it is the prescribed attire of high officers. The finer kinds of it form the ordinary dresses of the opulent, while the poorest manage to deck themselves in coarser, if not on common, at least on gala days. The embroidery of silk is carried on to an amazing extent. Cotton goods are also largely made, though great quantities of European and American manufactures are also imported. Flax is not grown, but a good substitute for it is found in the fibers of two or three plants, from which the beautiful grass cloth, similar in appearance to linen, is extensively woven. Woolens are made only to a limited extent. The porcelain of China has been famous from the earliest periods, and the manufacture of the finest forms of it was long known to the Chinese alone, though their productions are now surpassed by those of Europe. In lacquered ware the Chinese continue unsurpassed. In working in metals they have only attained to mediocrity. The metallic products most deserving of notice are gongs, mirrors, statuettes in copper and bronze, and various kinds of carved, chased, and filigree work, both in gold and silver. In a great number of minor articles the workmanship is exquisite—fans, card cases, seals, combs, chess men of wood, ivory, mother-of-pearl, tortoise shell, etc. Paper is made of a great variety of substances, and the art of making it—like various others—was practised in China long before Europe acquired it.

Commerce.—The inland trade of China, aided by its vast system of water communication, is of incalculable magnitude, the rivers and canals literally swarming with junks, barges, and boats of all sizes. Roads, however, are few and bad, and railways have as yet only made a mere commencement. Telegraphs have made more progress, though the lines as yet do not much exceed 3,000 mi. A defective postal system is kept up, partly by the government, partly by private enterprise. By the opening of the principal ports (the "treaty" ports, twenty-two in number) the foreign commerce has been immensely increased. The chief of these ports are, Shanghai (by far the first), Canton, Hankow, Swatow, Tientsin, Ning-po, and Foo-chow. The main articles of export are tea and raw and manufactured silk; the main imports, cotton goods, opium, metals, and metal goods. The total exports and imports usually amount to more than $200,000,000. Among the countries trading with China the principal are the U. S., Great Britain, India, and Russia. The quantity of opium imported, almost wholly from India, reaches the value of $25,000,000 or $30,000,000 annually. There are no national gold and silver coins. The usual

unit or denomination of money is the *tael*, the value of which varies according to the rate of exchange. Silver and gold bullion, usually stamped with the name of the banker and the year and district in which it is cast, are used in larger transactions. Private bankers are found in all large towns. They issue paper money, which passes current in the particular districts where they are known. The Mexican dollar, of the value of $1, is current in Canton and the south of China.

People.—The Chinese belong to the Mongolian race, but in them its harsher features, as represented in the genuine Tartars, are considerably softened. They are generally of low stature, have small hands and feet (the last artificially made so small in the females as to become a deformity), a dark complexion, a wide forehead, black hair, eyes and eyebrows obliquely turned upward at the outer extremities. In bodily strength they are far inferior to Europeans, but superior to most Asiatics, and their great assiduity and patient endurance of fatigue make them valuable as laborers. They are considered to be deficient in courage. In their moral qualities there is much that is amiable. They are strongly attached to their homes, hold age in respect, toil hard for the support of their families, and in the interior, where the worst kind of foreign intercourse has not debased them, exhibit un-

Foot of Chinese Girl (aged 16 years), in three positions: Copied from a cast in Trinity College, Dublin. (Length of foot, 4⅜ inches.)

sophisticated simplicity of manners which recalls the age of the patriarchs. In the great mass these qualities are counterbalanced, or rather supplanted, by numerous vices—treachery, lying, and various others. The Chinese use great politeness in their intercourse with each other; but there is perhaps a want of frankness and sincerity. They scrupulously avoid all contradiction and offensive expressions in conversation. Gambling is a universal vice. Drunkenness has hitherto been rare among them, but the habit of opium-smoking has much extended of late. But, with many vicious characteristics, the Chinese are preserved from degeneration by their universal frugality and thrift. Hard work, done in the most uncomplaining way, has become second nature with them. Filial piety is also a striking feature of their character, and is, in fact, the principle upon which Chinese society is constituted. They have chambers set apart for the worship of their ancestors, where religious ceremonies are regularly performed.

Language, Religion, Etc.—The Chinese is the most important and most widely spread of the so-called monosyllabic languages of Eastern Asia, in which each word is uttered by a single movement of the organs of speech. There is no alphabet, each word being represented by a single symbol or character. These written characters appear to have been originally hieroglyphics or rude copies of the objects designed to be expressed by them; but the hieroglyphic features have almost entirely disappeared, and many of the symbols are formed of what seems to be an arbitrary combination of lines, or are built up of other symbols combined. In writing or printing the characters are arranged in vertical columns, to be read from top to bottom. The art of making paper is said to have been known in the first century after Christ, and printing from wooden blocks in the seventh or eighth century, hundreds of years before these valuable arts were reinvented in Europe; and the Chinese literature is now very extensive. There are great numbers of treatises on almost all subjects — science, history, geography, belles-lettres, and poetry; literary eminence is the sure avenue to the highest honors and offices of the state, and hence "the *literati* are the gentry, the magistrates, the governors, the negotiators, the ministers of China." Among the more comfortable classes education of the kind which promises to be best rewarded is almost universal, and in every village there are schools for the lower classes, but attendance is not so general as was at one time supposed. The chief religions in China are Confucianism, Taouism, and Buddhism, the last introduced subsequently to the others. The religion of the learned and of the state, if it may be so called, is that founded by Kong-Fu-Tse or Confucius, about 550 B. C. Taouism, founded by Laotsze, is a compound of mystical and superstitious elements. But among the great mass of the people a form of Buddhism prevails, or a sort of mixture of the other three religions. In the western parts Mohammedanism has many followers. The most important Christian missions are those of the French Roman Catholics, who have been longest in the country and have numerous stations. Various Protestant bodies also carry on missionary operations in China, but hitherto with indifferent success, the Protestant converts only numbering from 25,000 to 30,000.

Government, Administration, etc.—The government is an absolute despotism. The reigning dynasty is of Manchu Tartar blood. The emperor unites in his person the attributes of supreme magistrate and sovereign pontiff, and as the "Son of Heaven" is in theory accountable only to heaven. Four principal ministers, two of whom are Manchus and two Chinese, form, along with two assistants, the inner council of state. The government business is distributed among seven boards, having cognizance respectively of all civil officers, of revenue, of rites and ceremonies, of military affairs, of crime, of public works, and of naval affairs. Besides these, there is the board of general supervision, or censorate composed of forty or

fifty mandarins, who go out into the empire as imperial inspectors, and are privileged to make any remonstrance to the emperor without endangering their lives. The provinces, either single or by twos, are under a governor and sub-governor, and each province has also a chief criminal judge and a treasurer. Particular magistrates preside over particular districts and cities, and instead of being permanent are changed about once in three years. Although very excellent in theory, the public administration is very deficient in integrity and efficiency. There is no check on the authorities, and the lower mandarins devote their attention to raising money to make up for their insufficient salaries or to purchase higher offices. The Chinese military force consists of the Manchurian army, 270,000 strong, and an army composed of Chinese and other races numbering about 800,000. Under English officers their training and discipline have much improved of late, and the newest kinds of rifles and cannons have been imported from Europe. The navy consists of two fleets—one for rivers and another for sea; but though it numbers many vessels, it is not very efficient, and is scarcely able to clear the Chinese coast from the pirates who infest the numerous creeks and islets. It has lately, however, been much strengthened by a number of steel corvettes built in England and Germany. The revenue of the empire is derived from customs, excise, taxes on land and property, and is said to amount to $250,000,000, of which one half is paid in kind. The external debt is only about $25,000,000.

History.—The early history of the Chinese is shrouded in fable, but it is certain that civilization had advanced much among them when it was only beginning to dawn on the nations of Europe. The Chow dynasty, which was founded by Woo-wang, and lasted from about 1100 B.C. to 258 B.C., is perhaps the earliest that can be regarded as historic, and even of it not much more is historic than the name. Under Ling-wang, one of the sovereigns of this dynasty, Confucius is said to have been born, some time in the sixth century B.C. During the latter half of the period during which this line of sovereigns held sway there appear to have been a number of rival kings in China, who lived in strife with one another. Chow-siang, who was the founder of the Tsin dynasty, from which China takes its name, gained the superiority over his rivals, and d. in 251 B.C. His great-grandson, a national hero of the Chinese, was the first to assume the title of "Hoang" (emperor), and called himself Che-Hoang-ti. He ruled over an empire nearly conterminous with modern China proper. In his reign, the great wall, designed as a protection against marauding Tartars, was begun in 214 B.C. Buddhism was introduced in 65 A.D. Subsequently the empire broke up into three or more states, and a long period of confusion and weak government ensued. In 960 a strong ruler managed to consolidate the empire, but the attacks of the Tartars were now causing much trouble. In

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the thirteenth century the Mongols under Jenghis Khan and his son Ogdai conquered China, and in 1259 the celebrated Kublai Khan, a nephew of the latter, ascended the throne and founded the Mongol dynasty. His ninth descendant was driven from the throne, and a native dynasty called Ming again succeeded in 1368 in the person of Hungwu. A long period of peace ensued, but was broken about 1618, when the Manchus gained the ascendency, and after a war of twenty-seven years founded the existing Tartar dynasty in the person of Tungchi, establishing their capital in the northern city of Peking, which was nearer their native country and resources than the old capital Nanking. The earliest authentic accounts of China published in Europe are those of Marco Polo, who visited the country in the thirteenth century. The first British intercourse was attempted under Queen Elizabeth in 1596, and a trade was subsequently established by the East India Company, but no direct intercourse between the governments took place till the embassy of Lord Macartney in 1792. A second embassy in 1816, by Lord Amherst, was treated with insolence; and subsequently the treatment of the British merchants became such that a collision was inevitable. In 1840 the British, on being refused redress for injuries, partly real and partly alleged, proceeded to hostilities, and after scattering, almost without a struggle, every force which was opposed to them, were preparing to lay siege to Nanking, when the Chinese found it necessary to sue for peace. A treaty was then concluded (1842), by which the five ports of Canton, Amoy, Foochow-foo, Ningpo, and Shanghai were opened to British merchants, the island of Hong-Kong ceded to the British in perpetuity, and the payment of $21,000,000 agreed to be made by the Chinese. In 1850 an insurrection, headed by Hung-seu-tseuan or Tien-te, broke out in the provinces adjoining Canton, with the object of expelling the Manchu dynasty from the throne, as well as of restoring the ancient national religion of Shan-ti, and of making Tien-te the founder of a new dynasty, which he called that of Tai-ping, or Universal Peace. After a long period of civil war the Tai-Ping rebellion was at length suppressed in 1865, chiefly by the exertions of General Gordon and other American and British officers at the head of the Chinese army. In October, 1856, the crew of a vessel belonging to Hong-Kong were seized by the Chinese. The men were afterward brought back, but all reparation or apology was refused. In consequence of this a war with China commenced, in which the French took part with the British. Peking had to be taken (1860) before the Chinese government finally gave way, and granted a treaty securing important privileges to the allies. A revolt of the Mohammedans in Turkestan had meantime taken place, but in 1874 it was at last suppressed, and in 1881 Russia restored the province of Kulja, thus completing the establishment of Chinese authority in Eastern Turkestan. The present emperor, Tsaitien, succeeded in 1875, but only assumed the reins

of government in 1887, on reaching the age of sixteen.

In 1894 China engaged in war with Japan on account of the inhabitants of Korea, who had divided into Chinese and Japanese factions, each faction appealing to the respective countries for aid. China was severely worsted, and in April, 1895, conceded the independence of Korea, ceded Formosa and the province of Feng Tien to Japan, and agreed to pay a war indemnity of $150,000,000.

In addition to the pecuniary and territorial cessions, China opened several cities and ports to the trade, residence and industries of the Japanese, and Japan was accorded the right to station consuls at any and all such cities and ports. Steam navigation for vessels under the Japanese flag was granted on the upper Yangtse-Kiang and on the Woo Sung and the canal.

This treaty produced a commotion in Europe when its terms were made public. Great commercial interests of several powers were deemed to be threatened by its ratification. Russia, Germany and France protested against the terms of settlement. Russia especially desired to prevent Japan from securing so strong a foothold on the shores of the Yellow Sea, which was to be the terminus of the Siberian railway. France and Germany also demanded a modification of the treaty. Japan finally yielded, but is supposed to have received $50,000,000 additional indemnity from China.

Foreign Aggression.—China has been the object of cupidity ever since 1586, when the Portuguese gained a foothold by leasing the island of Macao near Hongkong. This island became the permanent possession of Portugal in 1863. Great Britain seized the port of Hongkong in 1841, and has recently secured a lease for 99 years of the territory on the mainland opposite the island of Hongkong. France in 1862 acquired Cochin China, and has since increased its holdings by wars and aggressions. But these attainments were small indeed compared with what has been taken from China since the close of the China-Japanese war.

The Island of Formosa was ceded to Japan in accordance with the terms of the treaty of peace ratified and exchanged at Chefoo on the 8th of May, 1895. In November, 1897, the Germans seized the port of Kiau-Chau, on the east coast of Shantung, and in January, 1898, obtained from the Chinese government a 99-years' lease of the town, harbor, and district. By agreement with the Chinese government, dated March 27, 1898, Russia is in possession of Port Arthur and Talienwan and their adjacent territories and waters, on lease for the term of twenty-five years, which may be extended by agreement. Within the territories and waters leased, Russia has sole military and naval control, and may build forts and barracks as she desires. Port Arthur is closed to all vessels except Russian and Chinese men-of-war; part of Talienwan harbor is reserved exclusively for Russian and Chinese men-of-war, but the remainder is freely open to the merchant vessels of all countries. To the north is a neutral zone where Chinese troops

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shall not be quartered except with the consent of Russia. The territory acquired here by Russia has been formed into the Russian province of Kwangtung. The Russians have also secured a protectorate over Manchuria. For such period as Russia may hold Port Arthur, Great Britain is, by agreement with China, April 2, 1898, to hold Wei-Hai-Wei, in the province of Shantung. For defensive purposes Great Britain has, in addition, obtained a 99-years' lease of territory on the mainland opposite the island of Hongkong. To compensate for these advantages given to the Russians, British, and Germans, the Chinese government granted to the French in April, 1898, a 99-years' lease of the Bay of Kwang-Chau-Wan, on the coast of the Lien-Chau peninsula, opposite the island of Hainan. In November, 1899, China conceded to France the possession of the two islands commanding the entrance to the bay. This territory has been placed under the authority of the governor-general of French Indo-China.

In addition to these various grants of territory, the powers holding them have mapped off whole provinces and parts of provinces as their particular "spheres of influence." For instance, Great Britain has bound China "never to alienate any territory in the provinces adjoining the Yangtse-Kiang River to any other power, whether under lease, mortgage, or any other designation." This great rich valley, then, with an area of more than a half-million square miles, is the particular field which the British have parceled off for themselves. From the small concession of Kiau-Chau the Germans have extended their "sphere" over the whole province of Shantung in which it is situated, and which has an area of 53,762 square miles and a population of over 36,000,000. From her southern vantage ground the French have assumed the southern provinces of China as their sphere of influence; while Russia, coming down from the north with her Trans-Siberian railway, has appropriated whatever of Manchuria she wanted, the northern provinces of China Proper, and a good outlet for her trade at Port Arthur. Even Italy has tried to secure some concessions at Sanmun bay, which is about 200 miles south of Shanghai, and the surrounding districts in the province of Chehkiang. Thus far, however, she has not been successful in obtaining her demands.

Add to all these "leases" of territory and spheres of influence a great number of railroad concessions and mining grants to individuals and corporations in Europe and America, and it is not a great breach of the truth to say that China is mortgaged. Thirteen of the eighteen provinces wholly or in part are within the clutches of European nations, and while their hold upon them is not in many cases well defined, yet it is difficult to see how China in her condition will ever be able to relieve herself of the burden which she has unwillingly assumed.

Another class of foreign aggressors is constituted by the various missionary societies

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represented in China. It is estimated that there are fifty-three Protestant missionary societies operating in the empire, with over

Foreigners Not Wanted.—It is not strange that the Chinese should offer some resistance to this wholesale effort to supplant their ancient

CHINA.—Showing the provinces of China Proper and the Dependencies.

1,000 missionaries of European or American nationality, at 470 stations. These societies claim over 80,000 communicants and 30,000 day pupils. Roman Catholicism has long had a footing in China, and is estimated to have about 1,000,000 adherents, with twenty-five bishoprics besides those of Manchuria, Thibet, and Mongolia.

commercial, social, and religious customs. In fact, for a number of years there has existed a distinct anti-foreign party, and its force has been felt more than once in serious uprisings. It is only by knowing the nature of the parties in China that we can solve the peculiar situation prevailing at the time of the Boxer revolt

in the spring of 1900. The *North China Daily News*, published at Shanghai, recently printed an article by an official of the Chinese government, giving an account of the parties as they were constituted and managed at the time of the recent outbreak. The article follows: —

"At the beginning of the Boxer troubles in the vicinity of Peking all the officials, high and low, resolved themselves into two parties very distinctly marked. One was the Chinese party, composed of men of Chinese descent, who were opposed to the Boxers' crusade against foreigners as a whole, and who sought to advise the Empress Dowager to suppress or disperse the Boxers; and the others, the Manchu party, who were unanimously, with the exception of Prince Ching and Na Tung, in favor of war to the knife against all foreigners, and who therefore stoutly supported the Boxers and clamored for their being regularly organized and armed as government auxiliary troops to fight the foreign troops. The leaders of the Chinese party were the assistant grand secretary, Wang Wenshao; Hsu Ching-cheng, vice-president of the board of civil appointments, ex-minister to Russia, and president of the Chinese Manchurian railways; Hsu Yung-yi, president of the board of rites. The leaders of the Manchu party were the infamous and notorious Prince Tuan, Prince Chuang, Yung Lu, Kang Yi, and others. Unfortunately the Manchu party held the military power in its hands in the persons of Prince Tuan, commanding the Peking field force and the Huseng corps (all Manchus), and Lung Lu, the generalissimo of the Wuwei army, the grand army of the north. Under these circumstances the power of the Chinese party was actually nil, and it could only, once in a while, persuade the Empress Dowager to issue a decree or two ordering suppression of the Boxers or censuring them for their misdeeds. But this was only when the arch-conspirator, Kang Yi, happened to be away from Peking. Hence we have an explanation of the curious phenomenon of one day there appearing a decree ordering the suppression of the Boxers, and on the next day of another one, exactly opposed to its predecessor, praising up the Boxers, calling them 'patriots,' and ordering compensation to be paid them for their 'bravery and loyalty.'"

President Mc Kinley, in his message to congress, Dec. 3, 1900, sums up in a few sentences the causes of the revolt during the past year. He says:—

"The recent troubles in China spring from the anti-foreign agitation which for the last three years has gained strength in the northern provinces. Their origin lies deep in the character of the Chinese races and in the traditions of their government. The Taiping rebellion and the opening of Chinese ports to foreign trade and settlement disturbed alike the homogeneity and the seclusion of China.

"Meanwhile foreign activity made itself felt in all quarters, not alone on the coast, but along the great river arteries and in the remoter districts carrying new ideas and introducing new associations among a primitive people which has pursued for centuries a national policy of isolation.

"The telegraph and the railway spreading over their land, the steamers plying on their waterways, the merchant and the missionary penetrating year by year farther to the interior, became to the Chinese mind types of an alien invasion, changing the course of their national life and fraught with vague forebodings of disaster to their beliefs and their self-control.

"For several years before the present troubles all the resources of foreign diplomacy, backed by moral demonstrations of the physical force of fleets and arms, have been needed to secure due respect for the treaty rights of foreigners, and to obtain satisfaction from the responsible authorities for the sporadic outrages upon the persons and property of unoffending sojourners, which from time to time occurred at widely separated points in the northern provinces, as in the case of the outbreaks in Szechuen and Shantung.

"Posting of anti-foreign placards became a daily occurrence, which the repeated reprobation of the imperial power failed to check or punish. These inflammatory appeals to the ignorance and superstition of the masses, mendacious and absurd in their accusations and deeply hostile in their spirit, could not but work cumulative harm. They aimed at no particular class of foreigners; they were impartial in attacking everything foreign.

"An outbreak in Shantung, in which German missionaries were slain, was the too natural result of these malevolent teachings. The posting of seditious placards, exhorting to the utter destruction of foreigners and of every foreign thing, continued unrebuked. Hostile demonstrations toward the stranger gained strength by organization.

"The sect commonly styled the Boxers developed greatly in the province north of the Yangtse, and with the collusion of many notable officials, including some of the immediate councils of the throne itself, became alarmingly aggressive. No foreigner's life, outside of the protected treaty ports, was safe. No foreign interest was secure from spoliation.

"The diplomatic representatives of the powers in Peking strove in vain to check this movement. Protest was followed by demand, and demand by renewed protest, to be met with perfunctory edicts from the palace and evasive and futile assurances from the tsung-li-yamen. The circle of the Boxer influence narrowed about Peking, and while nominally stigmatized as seditious, it was felt that its spirit pervaded the capitol itself, that the imperial forces were imbued with its doctrines, and that the immediate counselors of the Empress Dowager were in full sympathy with the anti-foreign movement.

"The increasing gravity of the conditions in China and the imminence of peril to our own diversified interests in the empire, as well as to those of all the other treaty governments, were soon appreciated by this government, causing it profound solicitude. The United

States from the earliest days of foreign intercourse with China had followed a policy of peace, omitting no occasion to testify good will, to further the extension of lawful trade, to respect the sovereignty of its government, and to insure by all legitimate and kindly but earnest means the fullest measure of protection for the lives and property of our law-abiding citizens, and for the exercise of their beneficent callings among the Chinese people."

Revolt in 1900.— The recent anti-foreign disorders began in the provinces of Shantung and Chili as early as April, 1900. The government failed in several instances to take any notice of the depredations, and complaints from foreigners to their respective ministers at Peking became so numerous that they were said to have announced to the Chinese foreign office (tsung-li-yamen) that unless the society of Boxers was soon suppressed, troops would be landed and would march to the interior to protect foreigners. The outrages continued, and in the latter part of May affairs began to assume a serious aspect, not only for missionaries throughout the provinces, but even for the legations in Peking. The Chinese government forces in attempting to suppress a revolt in Peking, May 27, was defeated by the anti-foreign party, and it became evident that it would be necessary to dispatch troops to Peking at once to protect the legations. The following day the Boxers destroyed a part of the railway between Peking and Tientsin, thereby interrupting communication between the capital and the coast. Rear-Admiral Kempff, commanding the United States fleet in Chinese waters, on May 30, landed 100 marines at Taku and sent them to Tientsin, about thirty-five miles up the Peiho river, whence they were to go by rail to Peking. The British, German, Russian, French, and Italian war ships each landed 100 men, but when the attempt to send them to Peking was made, the Chinese government refused permission, declaring that the government was amply able to protect the legations. It was only after the admirals stated that if the men were not given permission to go, they would go without permission, that the Chinese finally consented. On the 31st of May the combined force went to Peking. These guards proved to be unequal to the task of restoring order.

Of what transpired in the early days of the revolt, as well as of what was suffered by the marines and the legations during the siege of Peking, the Secretary of the Navy gives a good description in his annual report. He says: —

"When an appeal for help came from the legations at Peking, this government not only had an adequate naval force at the nearest seaport town, but also was able to send forward immediately a force of marines for the protection of the United States legation. The small marine guard assigned to this duty under the command of Capt. John T. Myers consisted of fifty-six officers and men, made up of detachments from the U. S. S. *Oregon* and *Newark*. They reached the Chinese capital in the latter part of May, only a short time before the representatives and citizens of foreign countries in that city were subjected to siege, and cut off from communication with the rest of the world.

"The annals of history present few examples of more dramatic interest than the story of the beleaguered legations in Peking, from June 20, 1900, the date on which the German minister was killed and the siege began, until August 14, when the allied forces entered the Chinese capital. Official and unofficial reports, and particularly the dispatches of our minister, show the American marines bore their full share in the burdens of defense during the memorable siege. The United States legation was situated just inside of and near to the wall of the Tartar city. When the legations were assaulted, the American detachment immediately occupied a position on the city wall, a strategic point of great importance; established an improvised sandbag fort there, which enabled them to defend the section of wall immediately commanding the legations, and, although repeatedly attacked by overwhelming numbers, and on two occasions driven for a few minutes from the wall, they were never permanently dislodged, but held this vital position until relief came.

"Some days before the siege began, and while railway communication with the Chinese capital was still open, arrangements had been made for the prompt dispatch of another and larger detachment from our fleet at Taku. This second detachment was made up chiefly of seamen, and was ready in the early part of June to join such an expedition as the other governments interested might determine to send forward from their fleets at the mouth of the river.

"On the night of June 9, Admiral Seymour of the British navy, the ranking naval officer, received a telegram from the British minister at Peking, advising him that 'unless those at Peking were relieved soon, it would be too late.' At 9:30 the next morning a relief column, under command of Admiral Seymour, started for the Chinese capital by train, the expedition consisting of 915 British officers, seamen, and marines, 450 German, 312 Russian, 158 French, 112 American, 54 Japanese, 40 Italian, and 25 Austrian, a total of 2,066. Finding at Langfang that the railway had been so much damaged as to render it useless as a means of advance, this column, after ten days' fighting in a difficult country, without the transportation, ammunition, or supplies necessary to an extended campaign, encumbered by wounded to the number of 230, and entirely cut off from communication front and rear, was obliged, June 20, to fall back; and having on their return march captured the imperial armory near Hsiku, a few miles above Tientsin, they there awaited re-enforcements.

"In the meantime the foreign settlement in Tientsin itself was subjected to an attack, and communication between that city and Taku was interrupted. On the 19th of June a detachment

in great confusion in the passage, their artillery facing in both directions, and I could see no effort being made to extricate themselves and give passage into the city.

"One company of the Fourteenth Infantry deployed itself in the buildings to the right of the gate and poured effective fire onto the Tartar wall. Captain Reilly got two guns through a very narrow passage to his left, tearing down a wall to do so, and found a position a few yards to the left of the road where he could enfilade the Tartar wall, section by section, with shrapnel. The Fourteenth Infantry crossed the moat and, taking position paralleling the moat, deployed along a street facing the Tartar wall, and with the aid of the artillery swept it of Chinese troops. In this way, gradually working to the westward, the Tartar wall was cleared of opposition to the 'Haitmen gate' and beyond.

"Orders were sent to the Ninth to follow up the movement of the Fourteenth Infantry and Reilly's battery as soon as the wall was cleared of Chinese; also to follow the movement to the 'Chien-men' gate of the Tartar city. The marines were to follow the general movement, but later were ordered to protect the train. At about 3 o'clock P. M. our advance had arrived opposite the legations, the fire of the Chinese having practically ended, and we drew over to the Tartar wall and entered the legation grounds with the Fourteenth Infantry by the 'water gate or moat,' Reilly's battery passing through the 'Chien-men' gate, which was opened by the American and Russian marines of the besieged force. The Fourteenth Infantry was selected on this occasion in recognition of gallantry at Yangtsun and during this day. The British troops entered at the 'Shahuo' gate of the Chinese city, and following a road through the center of the city to opposite the legations, arrived there through the 'water gate or moat' in advance of the United States troops

"Having communicated with Minister Conger, I withdrew the troops from the legation and camped just outside near the Tartar wall for the night. My casualties during the day were 8 enlisted men wounded in the Fourteenth Infantry, 1 enlisted man wounded of Battery F, Fifth Artillery, and 1 officer and 2 enlisted men wounded of the marines.

"Upon entering the legations the appearance of the people and their surroundings, buildings, walls, streets, alleys, entrances, etc., showed every evidence of a confining siege. Barricades were built everywhere and of every sort of material, native brick being largely used for their construction, topped with sandbags made from every conceivable sort of cloth, from sheets and pillowcases to dress materials and brocaded curtains. Many of the legations were in ruins, and the English, Russian, and American, though standing and occupied, were filled with bullet holes from small arms and often having larger apertures made by shell. The children presented a pitiable sight, white and wan for lack of proper food, but the adults, as a rule, seemed cheerful and little the worse for their trying experience, except from anxiety and constant care. They were living on short rations, a portion of which consisted of a very small piece of horse or mule meat daily. The Christian Chinese were being fed upon whatever could be secured and were often reduced to killing dogs for meat. All the surroundings indicated that the people had been closely besieged, confined to a small area without any comforts, with no conveniences, and barely existing from day to day in hope of succor."

The legations were immediately adjacent to the interior imperial city, from the walls of which the Chinese fire had been directed upon them. As these walls were still held by Chinese troops, on the morning of the 15th General Chaffee proceeded to clear them of their defenders, successfully forcing three gates of the imperial city. On the sixteenth the imperial city was occupied, and the entire city was divided, by agreement, among the various forces for the maintenance of order. On the 28th of August a formal march was made through the forbidden precincts of the imperial palace, in which the troops of all the powers participated.

In the meantime there was almost continual fighting on the road from Tientsin to Peking between the Chinese and the forces who had been left to guard the long line of communication.

On the 25th of August General Chaffee was directed to hold his forces in readiness for instructions to withdraw, and just one month later he was instructed to send to Manila all the American troops in China with the exception of a legation guard, to consist of a regiment of infantry, a squadron of cavalry, and one light battery.

After the capture of Peking the troops of some of the powers made expeditions to the north and south of that city. The Japanese undertook to follow the Empress Dowager and members of the court in an endeavor to capture them. A considerable body of Russian troops pushed on to the north. The main force of Germans remained in Peking, but a small detachment was scouring the country around the city. On the 20th of September the allies stormed and captured the Peitang forts near Peking. In fact, for over two months small expeditions were being made to the interior districts wherever it was reported that Boxers could be found.

The Boxers.—Who are the Boxers? is a question often asked, and seldom answered definitely. An English diplomat who has lived in China for some time has written the following account of the Boxer society and its aims: "Of the many hundreds of secret societies of one sort and another in China but few are actively opposed to the present dynasty—opposed to it, that is to say, to the extent of wishing to rise against it and crush it. Unfortunately one of the most influential of those few is the brotherhood we now speak about so lightly. These Boxers are in reality a branch of the brotherhood universally dreaded in

China, as well as in Singapore, Penang, northern India, and parts of the United States, and known as the Sam Hop Wui, while among the European population of Canton, Shanghai, and Peking it is usually alluded to as the Great Triad society. This society, called also the Hung league, and known by many other titles as well, has been in existence so many hundreds of years that its origin is buried in obscurity. The membership of the Boxers, roughly speaking, is rather more than under 4,000,000, for the brotherhood was believed to have 4,000,000 members some ten years ago, and the membership is known to have increased considerably since then. The society is composed of lodges, each of which has a president, whose power for good and evil is considerable. Every president has under him two or more vice-presidents, who are bound to obey his every command or else suffer death. Next in power to the vice-presidents is a master, then come two introducers, then a fiscal, then thirteen counselors, a treasurer, a receiver, an acting treasurer, and a number of lesser agents, each of whom has particular duties assigned him. As for recruits, they have the option of voluntarily becoming members, though if they do not avail themselves of this 'privilege,' they are liable to be decoyed or else brought in by force. Then a body of the members of each lodge is deputed at regular intervals to 'produce' a certain number of recruits within a given period. Occasionally such recruits have to be captured by trickery."

Peace Negotiations.— The legations saved and peace restored, what next? The events of the previous few months had come upon the civilized world so unexpectedly, and had been so rapid in their occurrence, that the various interested powers were scarcely able to realize that such a state of affairs could possibly exist, let alone any defined idea of a proper punishment to fit the crime.

While the siege of Peking with its attendant horrors was in progress, it seemed that any action short of erasing the Chinese Empire from the map would be too lenient. But when the powers thought of assuming responsibility for the vast ungoverned or misgoverned horde of Chinese, it seemed best to make terms with the existing rulers if they could be found and if they still had any authority. It is to be remembered that the Empress Dowager and the whole court fled from Peking upon the approach of the allied forces. It was to be determined, first, who should be punished; was the Empress Dowager responsible for the atrocities, or was she really helpless to quell the Boxers and punish their leaders, many of whom were in high official position? Then, if a satisfactory settlement could be effected with the Chinese government, burdensome as it necessarily must be to China in her already mortgaged condition, could that government withstand the influence of the anti-foreign elements, and fulfill her part of the agreement?

Problems of another class were confronting

the powers which were demanding the punishment, as all of them, except America, had territorial or concessionary interests in China. As for the United States, her purpose was declared at the start. In commissioning General Chaffee to take command of the American forces in China, the Secretary of War closed his instructions as follows:—

"The forces under your command are to be used for the protection of the life and property of American citizens and American interests in China wherever the Chinese government fails to render efficient protection. You will communicate with the American minister in China and in general observe his wishes and answer to his demands in regard to his protection and that of the interests which he represents. You will confer freely with the representatives of the other powers in China which are engaged in the protection of their citizens and interests, and wherever it shall appear to you that the American interests which you are to protect will be best subserved by that course, you will act with the forces under your command concurrently with the forces of other powers. You will, however, avoid entering into any joint action or undertaking with other powers tending to commit or limit this government as to its future course of conduct, and you will avoid taking any action having any object except the protection of American interests hereinbefore charged upon you."

Upon this basis all the action in which the Americans have taken part has been conducted. The policy of the United States since the peace negotiations began was tersely stated by President Mc Kinley in his message to Congress, December 3, as follows:—

"Happily the acute disturbances were confined to the northern provinces. It is a relief to recall and a pleasure to record the loyal conduct of the viceroys and local authorities of the southern and eastern provinces. Their efforts were continuously directed to the pacific control of the vast populations under their rule, and to the scrupulous observance of foreign treaty rights. At critical moments they did not hesitate to memorialize the throne, urging the protection of the legations, the restoration of communication, and the assertion of the imperial authority against the subversive elements. They maintained excellent relations with the official representatives of foreign powers. To their kindly disposition is largely due the success of the consuls in removing many of the missionaries from the interior to places of safety.

"The policy of the United States through all this trying period was clearly announced and scrupulously carried out. A circular note to the powers, dated July 3, proclaimed our attitude. Treating the condition in the north as one of virtual anarchy, in which the great provinces of the south and southeast had no share, we regarded the local authorities in the latter quarters as representing the Chinese people, with whom we sought to remain in peace and friendship.

"Our declared aims involved no war against the Chinese nation. We adhered to the legitimate office of rescuing the imperiled legation, obtaining redress for wrongs already suffered, securing wherever possible the safety of American life and property in China, and preventing a spread of the disorders or their recurrence.

"As was then said, 'The policy of the government of the United States is to seek a solution which may bring about permanent safety and peace to China, preserve Chinese territorial and administrative entity, protect all rights guaranteed to friendly powers by treaty and international law, and safeguard for the world the principle of equal and impartial trade with all parts of the Chinese empire.'

"Faithful to those professions which, as it proved, reflected the views and purposes of the other co-operating governments, all our efforts have been directed toward ending the anomalous situation in China by negotiations for a settlement at the earliest possible moment. As soon as the sacred duty of relieving our legation and its dependents was accomplished, we withdrew from active hostilities, leaving our legation under an adequate guard in Peking as a channel of negotiation and settlement — a course adopted by others of the interested powers."

As for Germany, her minister had been assassinated, and she was outspoken against entering into any peace negotiations whatever until Minister von Ketteler's death had been avenged and all the leaders of the revolution put to death, and this under the auspices of the allied forces at Peking. Germany's field marshal, Count von Waldersee, was on his way to China, and her forces were being considerably augmented by soldiers from home, and the Emperor's instructions to them were to take terrible revenge; later, however, he was more moderate in his demands. All of the other powers objected to the German plan of exacting punishment of the leaders as a necessary prelude to peace negotiations. All agreed that the real culprits, the evil counselors who misled the imperial judgment and diverted the sovereign authority to their own guilty ends, must suffer.

Regarding this as the initial condition of an acceptable settlement between China and the powers, President Mc Kinley, in a message to the Chinese Emperor on October 18, said: "I trust that negotiations may begin as soon as we and the other offended governments shall be effectively satisfied of your Majesty's ability and power to treat with just sternness the principal offenders, who are doubly culpable, not only toward the foreigners, but toward your Majesty, under whose rule the purpose of China to dwell in concord with the world had hitherto found expression in the welcome and protection assured to strangers."

General bases of negotiation formulated by France were received with some favor by the various powers, and were accepted by some with certain reservations as to details. The United States on the whole favored the Russian proposition looking to the restoration of

China

the imperial power in Peking. This plan maintained that effective reparation for wrongs suffered, and an enduring settlement that will make their recurrence impossible, can best be brought about under an authority which the Chinese nation reverences and obeys.

On the 4th of September Li Hung Chang, Yung Lu, Hsu Tung, and Prince Ching were appointed peace commissioners by imperial edict to negotiate with the powers. When this fact had been duly announced to the various powers, instructions were at once forwarded to their representatives in Peking to open up negotiations. After over two months of delay, during which time the powers were exchanging suggestions and were trying to come to a definite and unanimous agreement, a set of "irrevocable conditions" was finally presented to the Chinese plenipotentiaries as a basis of settlement. These conditions, harsh as they are in many respects, were accepted by the Chinese Emperor, who, on the 30th of December, instructed the Chinese plenipotentiaries to sign the preliminary joint note which is as follows:—

"1. a. The dispatch to Berlin of an extraordinary mission headed by an imperial prince in order to express the regrets of his majesty, the Emperor of China, and of the Chinese government for the assassination of his excellency, the late Baron von Ketteler, minister of Germany.

"b. The erection on the spot of the assassination, of a commemorative monument, befitting the rank of the deceased, bearing an inscription in the Latin, German, and Chinese languages expressing the regrets of the Emperor of China for the murder.

"2. a. The severest punishment for the persons designated in the imperial decree of September 25, 1900, and for those whom the representatives of the powers shall subsequently designate.

"b. The suspension for five years of all official examinations in the cities where foreigners have been massacred or have been subjected to cruel treatment.

"3. Honorable reparation to be made by the Chinese government to the Japanese government for the murder of Mr. Sujyama.

"4. An expiatory monument to be erected by the imperial Chinese government in every foreign or international cemetery which has been desecrated or in which the graves have been destroyed.

"5. The maintenance, under conditions to be determined by the powers, of the interdiction against the importation of arms, as well as of material employed exclusively for the manufacture of arms and ammunition.

"6. Equitable indemnities for governments, societies, companies, and individuals, as well as for Chinese who, during the late occurrences, have suffered in person or in property in consequence of their being in the service of foreigners. China to adopt financial measures acceptable to the powers for the purpose of guaranteeing the payment of said indemnities

and the interest and amortization of the loans.

"7. The right for each power to maintain a permanent guard for its legation and to put the diplomatic quarter in a defensible condition, the Chinese having no right to reside in that quarter.

"8. The destruction of the forts which might obstruct free communication between Peking and the sea.

"9. The right to the military occupation of certain points, to be determined by an understanding among the powers, in order to maintain open communication between the capital and the sea.

"10. The Chinese government to cause to be published during two years in all the subprefectures an imperial decree—(a) embodying a perpetual prohibition, under penalty of death, of membership in any anti-foreign society; (b) enumerating the punishments that shall have been inflicted on the guilty, together with the suspension of all official examinations in the cities where foreigners have been murdered or have been subjected to cruel treatment, and (c), furthermore, an imperial decree to be issued and published throughout the empire ordering that the governors-general (viceroys) and all provincial or local officials shall be held responsible for the maintenance of order within their respective jurisdictions, and that in the event of renewed anti-foreign disturbances or any other infractions of treaty occurring, and which shall not forthwith be suppressed and the guilty persons punished, they, the said officials, shall be immediately removed and forever disqualified from holding any office or honors.

"11. The Chinese government to undertake to negotiate amendments to the treaties of commerce and navigation considered useful by the foreign powers, and upon other matters pertaining to their commercial relations, with the object of facilitating them.

"12. The Chinese government to determine in what manner to reform the department of foreign affairs and to modify the court ceremonials concerning the reception of foreign representatives, in the manner to be indicated by the powers.

"Until the Chinese government has complied with the above conditions to the satisfaction of the powers, the undersigned can hold out no expectation that the occupation of Peking and the provinces of Chili by the general forces can be brought to a conclusion."

All the powers have concurred in emphatic disclaimers of any purpose of aggrandisement through the dismemberment of the empire. The government of Russia has put forward a suggestion that in the event of protracted divergence of views in regard to indemnities the matter may be relegated to the court of arbitration at The Hague.

The powers named the high officials who were to be punished, and the Chinese government acted promptly in the matter. Several small military expeditions were made in the early months of 1901, but these could not be said to constitute a campaign. The peace negotiations progressed as rapidly as the dilatory tactics of the Chinese and the conflicting interests of the powers would permit. It was finally determined in May, 1901, that the amount of the indemnity to be demanded should be over $400,000,000. The Chinese officials protested that the present financial condition of the country would make it impossible to pay such an amount. The American troops were withdrawn from Peking in May, 1901.

China, Great Wall of, the largest artificial structure on the face of the earth, a barrier extending for about 1,500 mi. in the north of China proper, of which it partly forms the boundary. Its western end is in the deserts of Central Asia, its eastern reaches the sea to the northeast of Peking. It was erected as a barrier against the inroads of the barbarous tribes, and dates from about 214 B. C. It is carried over height and hollow, and avoids no inequality of the ground, reaching in one place the height of over 5,000 ft. above the sea. Earth, gravel, brick, and stone were used in its construction, and in some places it is much more substantial than in others.

China Ink, a black solid, which, when rubbed down with water, forms a very pure black indelible ink. It has been used in China from time immemorial. There are different accounts of the process, but it appears to be made by boiling the juices of certain plants with water to a syrup, adding to this a quantity of gelatin, and then thoroughly incorporating the carbonaceous matter. There is generally added some perfume — a little musk or camphor. The mass is then made into square columns of different sizes, which are often decorated with figures and Chinese characters.

China Ware, porcelain, the finest and most beautiful of all the kinds of earthenware, so called from China being the country which first supplied it to Europeans. The Chinese are said to have manufactured porcelain previous to the Christian era, but it was not till five or six centuries later that they attained any great perfection in the art. Japan also appears to have been early acquainted with the manufacture. In the beginning of the sixteenth century the ware was first introduced into Europe, and won immediate popularity by its beauty and novelty. For long it was thought impossible to fabricate anything similar in Europe, but at length John Frederick Böttcher or Böttiger, a native of Saxony who had long devoted himself to alchemy, discovered a means of producing a porcelain equal in whiteness to that of China. This led to the establishment by the government of the far-famed porcelain manufactory at Meissen, near Dresden. The Saxon porcelain soon became celebrated over Europe, and rivaled that of China in the excellence of its quality and the beauty of its decorations. Subsequently porcelain works were established at Vienna, Munich, and elsewhere in Germany. In France also about the middle of the eighteenth cen-

tury the celebrated factory at Sèvres was set up and soon acquired a great renown. The first successful attempt in England to manufacture porcelain was made by some Germans, who established a factory at Chelsea, from which, in 1748, it was transferred to Derby. About twenty years afterward the valuable discovery in Cornwall of an excellent species of clay contributed greatly to improve the quality of English porcelain, which now began to be largely manufactured in Staffordshire under the auspices of the celebrated Josiah Wedgwood. China ware, when broken, presents a granular surface, with a texture compact, dense, firm, hard, vitreous, and durable. It is semi-transparent, with a covering of white glass, clear, smooth, unaffected by all acids excepting the hydrofluoric, and resisting uninjured sudden changes of temperature. For the process of manufacture, see *Pottery*.

China Wax, a sort of wax deposited by insects on a deciduous tree with light green, ovate, serrated leaves, cultivated in the province of Si-chuen (Ssu-chuan) in Southwestern China. The insects, a species of Coccus are bred in galls which are formed on a different tree, an evergreen, and these galls are transported in great quantities to the districts where the wax trees are grown, to the branches of which they are suspended. Having emerged from the galls the insects spread themselves over the branches, which gradually become coated with a white waxy substance, reaching in 90 or 100 days the thickness of a quarter of an inch. The branches are then lopped off and the wax removed. It is white in color and is chiefly made into candles; it melts at 160° whereas tallow melts at about 95°.

Chincha Islands (chin′ chȧ), a group of small islands off the coast of Peru. Immense deposits of guano used to exist here, but are now exhausted. Guano from these islands began to be imported into Europe on an experimental scale about 1832, and the trade rapidly grew into importance. The Peruvian government retained the monopoly of the export, and made it one of the chief sources of its revenues.

Chinchil′la, a genus of South American herbivorous rodents very closely allied to the rabbit, which they resemble in the general shape of the body, in the limbs being longer behind than before, in the conformation of the rootless molars, and by the nature of the fur, which is more woolly and silky; but differing from the rabbit in the number of their incisors and molars, in a greater length of tail, and also in having broader and more rounded ears. *C. lanigĕra*, a species about 15 in. long, is covered with a beautiful pearly-gray fur, which is highly esteemed as stuff for muffs, pelisses, linings, etc. The chinchilla lives gregariously in the mountains of most parts of South America, and makes numerous and very deep burrows. It is of a gentle nature and very sportive.

Chinchilla.

Chinese Exclusion Act (or Geary Law).—The act of May 5, 1892, contains all laws now in force prohibiting and regulating the coming into the U. S. of Chinese persons and persons of Chinese descent, such act to remain in force for ten years from its passage. Any Chinese adjudged to be not lawfully entitled to remain in the U. S. shall be removed to China, unless he shall make it appear that he is a subject or citizen of some other country, in which case he shall be removed to such other country. All Chinese laborers within the U. S. must apply to the collector of internal revenue of their respective districts, within one year, for a certificate of residence; and any Chinese neglecting to do this shall be adjudged to be here unlawfully, and may be arrested and taken before a U. S. judge, who shall order that he be deported from the U. S., unless he shall prove that by sickness or unavoidable cause he has been unable to procure his certificate, and by at least one credible white person that he was a resident of the U. S. at the time of the passage of this act; and if upon the hearing it shall appear that he is so entitled to a certificate, it shall be granted upon his paying the cost. Any Chinaman other than a laborer, having a right to remain in the U. S., desiring such certificate, may apply for and receive the same. The constitutionality of this act was affirmed by the U. S. Supreme Court, May 15, 1893.

Ching′leput (ching′gl-put) (or Chengalpat), a coast district, and its capital, Hindustan, presidency Madras. The district, which lies s. of Arcot and Madras—area about 2,842 sq. mi—has generally a bad soil, broken up frequently by granite rocks. Pop. 981,381. This tract of country was in 1750 and in 1763 obtained by the East India Company from the Nabob of Arcot. The town is 15 mi. w. from the Bay of Bengal, and 35 mi. s.s.w. Madras, and has a pop. of 5,617.

Chink′apin, the American dwarf chestnut.

Chin-Kiang (or Tchang-Kiang), a city, China, province of Kiangsu, right bank of the Yang-tse-Kiang, near the junction of the Imperial Canal; one of the treaty ports, advantageously situated for trade, which it carries on to the value of several millions sterling a year. In 1842 it was taken by the British, after a determined resistance on the part of the Manchu garrison. It suffered severely in the Tai-Ping rebellion. Pop. 135,000.

Chinsu′rah, a town in Hindustan, 20 mi. n. of Calcutta, beautifully situated on the Hoogli, closely adjoining the town of Hoogli, and now included in its municipality. It is a military station, was formerly a Dutch settlement, and contains many neat houses in the Dutch style. Pop. 34,761.

Chioggia (ki-od′jå), a seaport town of Italy, on one of the lagoon islands of the Adriatic, 15 mi. from Venice. It is built partly on piles, and has some handsome edifices. Its harbor is fortified, and it has shipbuilding yards, fisheries, and a coasting trade. Pop. 20,381.

Chip′munk, the popular name in America of the ground squirrel, genus *Tamias*,

Chippeways (chip′e-wāz) (or Ojibbeways), a tribe of North American Indians, U. S. and Canada. They are distributed in bands round both sides of the basin of Lake Superior, where they once owned vast tracts. They are of the

Chipmunk.

Algonquin stock, tall, active, and well formed, subsist chiefly by hunting and fishing, and number about 18,000.

Chiquimula (chi-ki-mö′lå), a department of the Central American state of Guatemala. Area 4,000 sq. mi.; pop. 53,000.

Chiquitos (chi-kē′tōs), an Indian people of Bolivia, about the head waters of the Madeira and Paraguay. They number about 22,000, distributed among ten missions which still survive as a monument of Jesuit perseverance.

Chiriqui (chi-ri-kē′), a district in the state or department of Panama, Colombia. It is naturally very fertile, and has good harbors both on the Caribbean and Pacific coasts. The name is also given to a lagoon and an archipelago on the coast of this state.

Chiron (kī-ron), the most famous of the Centaurs, a race fabled as half men, half horses. He lived at the foot of Mt. Pelion in Thessaly, and was celebrated through all Greece for his wisdom and acquirements, particularly for his skill in medicine and music; and the greatest princes and heroes of the time — Bacchus, Jason, Hercules, Achilles, etc., — were represented as his pupils.

Chitaldrúg (chit-*a*l-drög′), a district and town of India, Mysore native state. The district, which is arid and stony, has an area of 4,571 sq. mi.; pop. 376,310. The town has fortifications constructed by Haider Ali, and was a station for British troops. Pop. 4,271.

Chitons (kī′tonz) (Chitonidæ), a family of gasteropods, affording the only instance known of a molluscan shell formed of many successive portions, often in contact and overlapping each other, but never truly articulated. The

Chiton.

shell in the typical genus *Chiton* is composed of eight pieces, the animal adhering to rocks or stones after the fashion of the limpet. The species are numerous, and there are few rocky shores without some of them.

Chittagong (chit-), a district, Hindustan, in the southeast of Bengal, having the Bay of Bengal on the west; area 2,567 sq. mi.; pop. 1,132,-341. The level lands, chiefly on the coast and the valleys are very fertile. A considerable majority of the inhabitants are Mohammedans. Chittagong is also the name of a commissionership or division of Bengal. Area 12,118 sq. mi.; pop. 3,574,048. The city of Chittagong, chief town of the district and second port in Bengal, is situated on the Karnaphuli about 12 mi. from its mouth. Though very unhealthy, its trade has of late been steadily increasing. Pop. 20,969.

Chittagong Wood, the wood of several Indian trees, especially of *Chickrassia tabulāris*, order Cedrelaceæ, a light-colored, beautifully grained wood used by cabinet makers.

Chivalry (chiv′al-ri), a term which indicates strictly the organization of knighthood as it existed in the Middle Ages, and in a general sense the spirit and aims which distinguished the knights of those times. The chief characteristics of the chivalric ages were a war-like spirit, a lofty devotion to the female sex, a love of adventure, and an undefinable thirst for glory. The Crusades gave for a time a religious turn to the spirit of chivalry, and various religious orders of knighthood arose, such as the Knights of St. John, the Templars, the Teutonic Knights, etc. The education of a knight in the days of chivalry was as follows: In his twelfth year he was sent to the court of some baron or noble knight, where he spent his time chiefly in attending on the ladies, and acquiring skill in the use of arms, in riding, etc. When advancing age and experience in the use of arms had qualified the page for war, he became an *esquire* or *squire*. This word is from L. *scutum*, a shield, it being among other

offices the squire's business to carry the shield of the knight whom he served. The third and highest rank of chivalry was that of knighthood, which was not conferred before the twenty-first year, except in the case of distinguished birth or great achievements. The individual prepared himself by confessing, fasting, etc.; religious rites were performed, and then, after promising to be faithful, to protect ladies and orphans, never to lie nor utter slander, to live in harmony with his equals, etc., he received the *accolade*, a slight blow on the neck with the flat of the sword from the person who dubbed him a knight. This was often done on the eve of battle, to stimulate the new knight to deeds of valor; or after the combat, to reward signal bravery. Though chivalry had its defects, chief among which, perhaps, we may note a tendency to certain affectations and exaggerations of sentiment and profession, yet it is to be regarded as tempering in a very beneficial manner the natural rudeness of feudal society. As a system of education for the nobles it taught them the best ideals, social and moral, which the times could understand, and filled a place in civilization which as yet the arts and letters could hardly occupy.

Chladni (*h*lăd'nē), Ernst Florent Friedrich (1756–1827), German physicist. He investigated the laws of sound and made important experiments on the vibration of metallic and glass plates of various forms. His works include *Discoveries Concerning the Theory of Sound* (1787); *Acoustics* (1802); *Contributions to Practical Acoustics, with Remarks on the Making of Instruments* (1822); etc.

Chlo'ral, a liquid first prepared by Liebig by passing dry chlorine gas through absolute alcohol to saturation, afterward by Städeler by the action of hydrochloric acid and manganese on starch. The *hydrate* of *chloral*, as now prepared is a white crystalline substance, which, in contact with alkalies, separates into chloroform and formic acid. Chloral kills by paralyzing the action of the heart. It is a hypnotic as well as an anæsthetic, and is frequently substituted for morphia. It has been successfully used in delirium tremens, St. Vitus's dance, poisoning by strychnia, in tetanus, and in some cases of asthma and whooping cough. It should be taken with great caution and under medical advice, as an extra dose may produce serious symptoms and even death. The treatment of poisoning by chloral is to keep the person warm by means of blankets, warm bottles, etc. Warm stimulating drinks should also be administered, such as hot coffee, hot tea, negus, etc. It has been shown that an animal kept warm by wrapping in cotton wool recovered from a dose of chloral that otherwise would have killed it.

Chlo'rate, a salt of chloric acid. The chlorates are very analogous to the nitrates. They are decomposed by a red heat, nearly all of them being converted into metallic chlorides, with evolution of pure oxygen. They deflagrate with inflammable substances with such facility that an explosion is produced by slight causes. The chlorates of sodium and potassium are used in medicine. The latter, in doses of from five to twenty grains, is largely used in scarlet fever, inflamed throat, etc. It is also used in the manufacture of lucifer matches, fireworks, and percussion caps.

Chloric Ether, a volatile liquid obtained by passing hydrochloric acid gas into alcohol to saturation and distilling the products.

Chlo'rine, an elementary gaseous substance discovered by Scheele in 1774, who named it *dephlogisticated marine acid.* It was afterward proved by Davy to be a simple body, and from its peculiar yellowish-green color the appellation of chlorine was given to it. It is always found in nature in a state of combination. United with sodium it occurs very largely as the chloride of sodium or common salt, from which it is liberated by the action of sulphuric acid and manganese dioxide. Chlorine is a very heavy gas, being about two and a half times as heavy as ordinary air; it has a peculiar smell, and irritates the nostrils most violently when inhaled, as also the windpipe and lungs. It exercises a corrosive action upon organic tissues. It is not combustible, though it supports the combustion of many bodies, and, indeed, spontaneously burns several. In combination with other elements it forms chlorides, which act most important parts in many manufacturing processes. This gas may be liquefied by cold and pressure, when it becomes a transparent, greenish-yellow, limpid liquid. Chlorine is one of the most powerful bleaching agents, this property belonging to it through its strong affinity for hydrogen. Hence in the manufacture of bleaching powder it is used in immense quantities. When applied to moistened colored fabrics it acts by decomposing the moisture present, the oxygen of which then destroys the coloring matter of the cloth, etc. It is a valuable disinfectant where it can be conveniently applied, as in the form of chloride of lime.

Chlo'rite, a mineral of a grass-green color, opaque, usually friable or easily pulverized, composed of little spangles, scales, prisms, or shining small grains, and consisting of silica, alumina, magnesia, and protoxide of iron. It is closely allied in character to mica and talc. There are four sub-species—chlorite earth, common chlorite, chlorite slate, and foliated chlorite.

Chlo'roform, the perchloride of formyle, a volatile, colorless liquid of an agreeable, fragrant, sweetish, apple taste and smell, of the specific gravity of 1.48, and discovered by Soubeiran and Liebig in 1832. It is prepared by cautiously distilling together a mixture of alcohol, water, and chloride of lime or bleaching powder. Its use as an anæsthetic was introduced in 1847 by Professor (afterward Sir) James Y. Simpson, of Edinburgh. For this purpose its vapor is inhaled. The inhalation of chloroform first produces slight intoxication; then, frequently, slight muscular contractions, unruliness, and dreaming; then loss of voluntary motion and consciousness, the patient appear-

ing as if sound asleep; and at last, if too much be given, death by coma and syncope. When skillfully administered in proper cases it is considered one of the safest of anæsthetics; but it requires to be used under certain precautions, as its application has frequently proved fatal. Chloroform is a powerful solvent, dissolving resins, wax, iodine, etc., as well as strychnine and other alkaloids.

Chlo′rophyll, the green coloring matter of plants. It plays an important part in the life of the plant, as it breaks up the carbonic acid gas taken in by the stomata of the leaves into its two elements, carbon and oxygen, returning the oxygen to the air, and converting the carbon with the water obtained from the roots into starch. Light is indispensable to the formation of chlorophyll, and hence arises the etiolation or bleaching of plants by privation of light, either by the art of the gardener or from accidental causes.

Choate, Rufus (1799–1859), American jurist and orator. In 1830 he was elected to Congress; also in 1832. In 1841 he succeeded Daniel Webster in the U. S. Senate, serving until 1845. In many respects he was the most scholarly of American public men, and among the greatest forensic advocates America has produced.

Choc′olate, a paste composed of the kernels of the cacao-tree, ground and combined with sugar and vanilla, cinnamon, or other flavoring substance; also a beverage made by dissolving chocolate in boiling water or milk. It was used in Mexico long before the arrival of the Spaniards, and is now largely used in South America, Spain, Italy, and Germany, but in Britain cocoa, which is a preparation from the same fruit, is much more common. The cocoa bean, from which chocolate is made, is the seed of a mushy pod which is the fruit of the cacao or cocoa tree. This tree is found in Central America, Mexico, South America, the West and East Indies, Brazil, and Caracas. The cocoa bean is about the size of a pecan nut. The kernel of the bean is called the nib, and from the nibs chocolate and cocoa are made. The beans are roasted in a cylindrical machine which turns slowly over a coal fire. The roasting is for the purpose of making the shells brittle so they will come off easily. After the roasting process the beans are allowed to cool and are then carried to a machine known as a "cracker and fanner." This machine cracks and removes the shell and then fans the shell out of the way, leaving the nibs. The nibs are then put into a grinding machine. The bean is about half oil and this is apparent when the nibs are fed into the grinding machine. The first revolution sends out thick chocolate paste. As it comes from the stones the chocolate looks just as it does when it is mixed for chocolate cake. The ground chocolate is then placed in kettles for the purpose of completing the stirring up. Afterward it is placed in little tins and carried to the cooling room to solidify into cakes, which are then wrapped for shipment.

Choc′taws, a North American Indian tribe

now settled on a portion (10,450 sq. mi.) of the Indian Territory on the Red River. They formerly inhabited what is now the west part of Alabama and south part of Mississippi. They cultivate the soil, are partially civilized, having regular constitution prefaced with a bill of rights, courts of justice, books and newspapers.

Choiseul (shwä-seul), an ancient French family which has furnished many distinguished individuals. One of the best known is Etienne François, duke of Choiseul-Amboise(1719–1785). After distinguishing himself on various occasions in the Austrian War of Succession, he returned to Paris, where his intimacy with Madame de Pompadour furnished the means of gratifying his ambition. After having been ambassador at Rome, and at Vienna, he became in reality prime minister of France. He negotiated the famous Family Compact which reunited the various members of the Bourbon family, and restored Corsica to France. His fall was brought about in 1770 by a court intrigue, supported by Madame du Barry, the new favorite of the king. He was banished to his estates, but his advice in political matters was frequently taken by Louis XVI.

Choke-damp (or After-damp), the name given to the irrespirable gas found in coal mines after an explosion of fire-damp or light carbureted hydrogen.

Cholera (kol′ĕ-ra), an acute contagious and very fatal disease. In its more ordinary form it commences with sickness, vomiting, or perhaps two or three loose evacuations of the bowels; after which follow a sense of burning at the præcordia, an increased purging and vomiting of a white or colorless fluid, great prostration of strength, spasms at the extremities, which increase in violence with the vomiting and purging. Such cases may last from twelve to thirty-six hours; after this the patient generally sinks into a state of extreme collapse, and this stage in most cases passes by a gradual transition into a febrile one, which in a majority of instances proves fatal. Sometimes the patient is suddenly stricken down and dies, collapsed within a few hours without diarrhœa or vomiting. This disease is endemic in certain parts of Asia (hence it is sometimes called Asiatic cholera), and is liable to spread to other parts of the world, usually by the ordinary channels of commercial intercourse. It first appeared in Europe in 1829, and reached Britain in 1831, spreading thence to America. Western Europe was again visited by it in 1847, 1853, 1865, 1873, 1875, and in 1885, when Spain and the south of France suffered severely.

The primary and essential element in the production of cholera has been ascertained to be a constituent of the excreta of cholera patients. Whether this particular substance is the germ of a fungus or other form of minute life is not quite certain, but that it is an organism capable of propagating itself when it is taken into the alimentary canal in food, impure water, or the like, is beyond a doubt. Doctor Koch asserts that the essential cause is a bacillus, having the form of a curved rod,

hence called the *common bacillus*, and that the disease is caused by the multiplication of this organism in the small intestines. The fact that great numbers are present in persons suffering from cholera is generally admitted, but it is doubted by other experts if they do actually produce the disease. A method of protective inoculation against cholera has been lately tried in Spain, but with small success. The contagion of cholera is not so likely to be conveyed by personal intercourse as by residence in an infected district. Sanitary measures have proved to be the only efficacious means of arresting an epidemic; insanitary conditions decidedly favor it.

What is called *cholera morbus* is a bilious disease, long known in most countries, and is characterized by copious vomiting and purging, with violent griping, cramps of the muscles of the abdomen and lower extremities, and great depression of strength. *Cholera infantum* (infants' cholera) is the name sometimes given to a severe and dangerous diarrhœa to which infants are liable in hot climates or in the hot season.

Cholesterine (kō-les'ter-in), a substance found in bile, blood, etc., which may be obtained in the form of beautiful pearly crystalline scales, without taste and odor. It is widely distributed in the animal economy, being essential to the brain and nerve substance, and having been found in milk, and many portions of the body, both as a normal and a pathological constituent.

Cholos (chō'lōs), in Peru, the name for those who are partly of white, partly of Indian parentage, the most numerous class of the community.

Cholula (chō-lö'lå), a town of Mexico, 60 mi. s.e. by e. of Mexico, formerly a large city, the seat of the religion of the ancient Mexicans, with more than 400 temples. One of these temples still remains, built in the form of a pyramid, each side of its base measuring 1,440 ft., and its height in all 164 ft. On the top is a chapel of Spanish origin. Pop. 10,000.

Chonos Archipelago (chō'nōs), a group of islands lying off the west coast of Patagonia. Two are large, but they are all barren and scantily inhabited.

Chopin (sho-paṇ), Frédéric François (1810–1849), pianist and musical composer, of French extraction, was b. at Warsaw, went to Paris in 1831 on account of the political troubles of Poland, and died there. He wrote numerous pieces for the pianoforte, chiefly in the form of nocturnes, polonaises, waltzes, and mazurkas; all of which display much poetic fancy, abounding in subtle ideas with graceful harmonic effects.

Chopine (chop-ēn'), a very high shoe or elevated clog, introduced into England from Venice, in the reign of Queen Elizabeth, and which became the fashionable wear of court ladies during that reign. They were made of wood covered with leather of sundry colors, white, red, yellow, and sometimes gilt. Some of them were of great height, as much as 18 in., the height of the chopine being seemingly regarded as a mark of the rank of the wearer.

Chop Sticks, the Chinese substitute for our knife, fork, and spoon at meals, consisting of two smooth sticks of bamboo, wood, or ivory, which are used for conveying meat to the mouth with wonderful dexterity.

Choragus (ko-rā-'), a name given by the Greeks to the leader or director of the choruses furnished for the public festivals and who also defrayed the expenses of the chorus. The choragus who was adjudged to have performed his duty best received a tripod of brass, for which he had to build a monument, on which it was placed. A street in Athens which contained a great number of these choragic monuments was called the "street of the tripods." A handsome choragic monument was erected near the Art Palace at the World's Columbian Exposition in Chicago in 1893.

Chord (kord), in music, the simultaneous combination of different sounds, consonant or dissonant. The common *chord* consists of a fundamental or bass note with its third and fifth. When the interval between the bass note and its third is two full tones the combination is a *major chord;* when the interval is a tone and a half the combination is termed a *minor chord;* when the intervals between the bass note and its third and the third and the fifth are each a tone and a half, the chord is called *diminished.* The *tonic chord* is made up of the key note and its third and fifth; the *dominant chord* consists of the dominant or fifth of the scale accompanied by its third and fifth; the *subdominant chord* has for its root or bass the subdominant or fourth of the scale, accompanied with its third and fifth. In geom. a chord is a straight line drawn, or supposed to extend, from one end of an arc of a circle to the other.

Chorley (chor'li), a market town of England, Lancashire, 20 mi. n.w. of Manchester, with manufactures of cotton goods, calico printing, and dye-wood works, floor cloth works, iron foundries, etc. In the vicinity are coal, lead, and iron mines. Pop. 23,082.

Chorus (kō'rus), originally an ancient Greek term for a troop of singers and dancers, intended to heighten the pomp and solemnity of festivals. During the most flourishing period of ancient tragedy (B.C. 500–400) the Greek chorus was a troop of males and females, who, during the whole representation, were spectators of the action, never quitting the stage. In the intervals of the action the chorus chanted songs, which related to the subject of the performance. Sometimes it even took part in the performance, by observations on the conduct of the personages, by advice, consolation, exhortation, or dissuasion. In the beginning it consisted of a great number of persons, sometimes as many as fifty; but the number was afterward limited to fifteen. The exhibition of a chorus was in Athens an honorable civil charge, and was called *choragy.* Sometimes the chorus was divided into two parts, who sung alternately. The divisions of the chorus were not stationary, but moved from one side of the

stage to the other; from which circumstance the names of the portions of verse which they recited, *strophe*, *antistrophe*, and *epode*, are derived. In music, the chorus is that part of a composite vocal performance which is executed by the whole body of the singers, in contradistinction to the solo airs, and concerted pieces for selected voices. The singers who join in the chorus are also called the chorus. The term is also applied to the verses of a song in which the company join the singer, or the union of a company with a singer in repeating certain couplets or verses at certain periods in a song.

Chose in Action (Fr. *chose*, "a thing") is one of the two great classes of what the English law calls chattels personal. The one class is "choses in possession," such as goods, household furniture, cattle, etc; the other class is "choses in action," such as the right to sue for a debt, a legacy, damages, etc. In the U. S. that quality of a chose in action rendering it unassignable at common law is fast disappearing. In some states a chose in action may not only be assigned, but the assignee may bring a suit for possession in his own name; while in others the name of the assignor is used as plaintiff in the action, to the use of the assignee. Courts of law generally follow the rules of equity in this respect.

Chosroes I (kos'ro-es) (A. D. 531–579), surnamed the "Just," the greatest of the Sassanid kings of Persia. At his accession Persia was involved in a war with the Emperor Justinian, which Chosroes terminated successfully, obliging Justinian to purchase peace by the payment of a large sum of money. In 540, however, jealous of the victories of Belisarius, the great general of the empire, Constantine violated the peace, invaded Syria, laid Antioch in ashes, and returned home laden with spoils. The war continued till 562, when the emperor again purchased peace by an annual tribute of 30,000 pieces of gold. The peace continued for ten years, when the war was renewed with Justin, the successor of Justinian, when Chosroes was again successful. The following emperor, Tiberius, at length completely defeated the Persians in 578.

Chota Nagpore (or Chutia Nágpur), a division of British India, presidency Bengal, divided into the districts of Lohardaga, Hazaribagh, Singbhum, and Manbhum, and 9 feudatory states. Total area 43,020 sq. mi.; pop. 4,903,991.

Chouans (shö-än), a name given to the royalist peasantry of Brittany and Lower Maine, who carried on a petty warfare against the republican government from an early period of the French Revolution. The name was finally extended to all the Vendeans. The name was derived from the first chief of the Chouans, Jean Cottereau, who with his three brothers organized these bands in 1792. Cottereau had joined a band of dealers in contraband salt, and acquired the surname *Chouan* from the cry of the screech owl, which he used as a signal with his companions. He was killed in an engagement with the republican troops in 1794. The Chouans were not suppressed till 1799, and even after that occasional spurts of insurrection occurred down till 1830, when they were finally put down.

Chough (chuf) (Cornish Chough, or Red-legged Crow), a bird belonging to the crow family, but nearly allied to the starlings. *F. graculus* is the only British or European

Chough.

species, and frequents, in England, chiefly the coasts of Cornwall. Its general color is black, contrasting well with the vermillion red of the beak, legs, and toes. There are other species, natives of Australia, Java, etc.

Christ, a title of our Saviour, now used almost as a name or part of his name.

Christchurch, a town of England, county of Hampshire, 21 mi. s.w. of Southampton. There is a fine old priory church, dating from the time of William Rufus, with a magnificent stone altar screen. Pop. 53,270.

Christchurch, a town of New Zealand, capital of the province of Canterbury, and the see of the primate of New Zealand, is situated on the Avon River, 7 mi. from Port Lyttelton, with which it has railway communication. It contains a number of handsome buildings, among which are the provincial government offices, the cathedral, St. Michael's Church, the supreme court, hospital, museum, town library, etc. There are a fine park, a botanic garden, and high class educational and other institutions. Pop. 16,223, or including extensive suburbs, 47,846.

Christ Church College, Oxford, a college protected by Cardinal Wolsey, and established in 1546 by Henry VIII. It has the patronage of above ninety livings.

Christian, the name of nine Danish kings. Of these Christian II (1480–1559), king of Denmark, Norway, and Sweden, attained the throne in 1513, and in 1518 usurped the throne of Sweden, from which he was expelled by Gustavus Vasa in 1522. He was deposed by his Danish subjects in 1523, and retired to the Netherlands, whence he returned in 1531 with an army, but was defeated, and kept in confinement till his death. Christian IV (1577-

1648), king of Denmark, son of Frederick II and the Princess Sophia of Mecklenburg, succeeded to the throne as a minor in 1588. In the Thirty Years' War he was beaten by Tilly at Lutter in 1626, but afterward, in conjunction with Gustavus Adolphus, obtained the treaty of Lübeck, 1628. He has the merit of having laid the foundation of the Danish navy, extended the trade of his subjects to the East Indies, and fitted out several expeditions for the discovery of a northwest passage.

Christian Era, the great era now almost universally employed in Christian countries for the computation of time. It is generally supposed to begin with the year of the birth of Christ; but that event seems to have taken place four years before the present established beginning of the era. Time before Christ is marked B.C., after Christ A.D. The era is computed from January 1, in the fourth year of the 194th Olympiad, and the 753d from the building of Rome. It was first used by Dionysius, a Syrian monk, in the sixth century, but did not become general until about the middle of the fifteenth century.

Christiania, a city and port, the capital of Norway, province Aggershuus or Christiania, at the head of the long, narrow inlet called Christiania Fjord, about 60 mi. from the open sea or Skagerrack. The houses are mostly of brick and stone, generally plain buildings, devoid of architectural pretension. Important public buildings are the royal palace, the house of representatives or *Storthing*, the governor's palace and cathedral. An interesting building is the fine old castle of Aggershuus, with its church and citadel crowning a point jutting out into the fjord. Attached to the university—the only one in Norway, opened in 1813—is a museum, containing a fine collection of antiquities. The manufactures of the city consist of woolen cloth, ironware, tobacco, paper, leather, soap, spirits, glass, etc., and there are extensive breweries. The exports are principally timber and iron. The environs are exceedingly beautiful. Pop. 122,424.

Christianity, the religion instituted by Jesus Christ. Though the great moral principles which it reveals and teaches, and the main doctrines of the gospel, have been preserved without interruption, the genius of the different nations and ages have materially colored its character. The first community of the followers of Jesus was formed at Jerusalem soon after the death of their Master. Another at Antioch in Syria first assumed (about 65) the name of *Christians;* and the travels of the apostles spread Christianity through the provinces of the Roman Empire. Palestine, Syria, Asia Minor, Greece, the islands of the Mediterranean, Italy, and the northern coast of Africa, as early as the first century, contained societies of Christians. At the end of the third century almost one half of the inhabitants of the Roman Empire, and of several neighboring countries, professed this belief. While Christianity as a system was thus spreading, many heretical branches had sprung from the main trunk. From the Gnostics, who date from the days of the apostles, to the Nestorians of the fifth century, the number of sects was large, and some of them exist to the present day. The most important events in the subsequent history of Christianity are the separation of the Eastern and Western churches early in the eighth century; and the Western reformation, which may be said to have commenced with the sectaries of the thirteenth century, and ended with the establishment of Protestantism in the sixteenth. The number of Christians now in the world is computed at 450,000,000. Of these about 212,000,000 are Roman Catholics, 83,000,000 belong to the Greek Church, and 155,000,000 are Protestants. Of the various sects of Protestants the most numerous are the Lutheran, the Calvinistic, and the Anglican Church.

Christians (or Christian Connection), the name of a denomination in the U. S. and Canada, adopted to express their renunciation of all sectarianism. They are to be met with in all parts of the country, the number of their churches being estimated at over 1,000. Each church is an independent body; the Scriptures are their only rule of faith, and admission to the church is obtained by a simple profession of belief in Christianity. As a rule they are anti-trinitarians and baptists.

Christian IX, king of Denmark, b. April 8, 1818; succeeded to the throne in 1863. His eldest daughter, Alexandra, is married to King Edward VII.; his second daughter, Dagmar, is the wife of the reigning czar. and his second son, George, is king of the Hellenes.

Christian, prince of Schleswig-Holstein, b. in 1835; married, 1866, the Princess Helena, third daughter of Queen Victoria. He is a general in the British army.

Christian Scientists (The Church of Christ, Scientist), a sect of professing Christians, originated in 1866 by Mary Baker Eddy, whose book, *Science and Health, with Key to the Scriptures*, defines the principles of the cult. They claim that disease and evil are only the creations of the imagination and can be removed by prayer. The membership is over 100,000.

Christi'na, Queen of Sweden (1626–1689), daughter of Gustavus Adolphus. After the death of Gustavus, at Lützen, in 1632, the states-general appointed guardians to the Queen Christina, then but 6 years old. Her education was continued according to the plan of Gustavus Adolphus. She learned the ancient languages, history, geography, politics, and renounced the pleasures of her age in order to devote herself entirely to study. In 1644 she took upon herself the government. A great talent for business, and great firmness of purpose, distinguished her first steps. She terminated the war with Denmark begun in 1644, and obtained several provinces by the treaty concluded at Bromsebro in 1645. Her subjects wished that she should choose a husband, but she manifested a constant aversion to marriage. During this time her patronage of learned men, artists, and the like, was lavish. In 1650 she caused herself to be crowned with great pomp, and with the title of *king*.

From that time a striking change in her conduct was perceptible. She neglected her ancient ministers, and listened to the advice of ambitious favorites. Intrigues and base passions succeeded to her former noble and useful views. The public treasure was squandered with extravagant profusion. In 1654 she abdicated in favor of her cousin Charles Gustavus, reserving to herself a certain income, entire independence, and full power over her suite and household. A few days after, she left Sweden and went to Brussels, where she made a public entry and remained for some time. There she made a secret profession of the Catholic religion which she afterward publicly confirmed in Innsbruck. From Innsbruck she went to Rome, which she entered on horseback in the costume of an Amazon, with great pomp. When the Pope Alexander VII confirmed her she adopted the surname of *Alessandra.* For some time she resided at Paris, and incurred great odium by the execution of her Italian equerry Monaldeschi for betrayal of confidence. Subsequent attempts which she made to resume the crown of Sweden failed, and she spent the rest of her life in artistic and other studies at Rome. She left an immense art collection and a large number of valuable MSS. Her writings were collected and published in 1752.

Christina, Queen-regent of Spain, b. July 21, 1858; second daughter of the late Archduke Charles of Austria. In 1879 she was married to Alfonso XII of Spain, to whom she bore two children; the Infanta Mercedes, and Alfonso, present king of Spain.

Christmas (kris'mas), the festival of the Christian church observed annually on December 25 in memory of the birth of Christ, and celebrated by a particular church service. The time when the festival was first observed is not known with certainty; but it is spoken of in the beginning of the third century by Clement of Alexandria, and in the latter part of the fourth century Chrysostom speaks of it as of great antiquity. As to the day on which it was celebrated, there was long considerable diversity, but by the time of Chrysostom the Western church had fixed on December 25, though no certain knowledge of the day of Christ's birth existed. The Eastern church, which previously had generally favored January 6, gradually adopted the same date. Many believe that the existence of heathen festivals celebrated on or about this day had great influence on its being selected; and the Brumalia, a Roman festival held at the winter solstice, when the sun is as it were born anew, has often been instanced as having a strong bearing on the question. In the Catholic, Greek, Anglican, and Lutheran churches, there is a special religious service for Christmas day; and, contrary to the general rule, a Catholic priest can celebrate three masses on this day. Most other churches hold no special service, but almost everywhere throughout Christendom it is kept as a holiday and occasion of social enjoyment.

Christmas Cards, ornamental cards containing words of Christmas greeting to friends to whom they are sent. The first of them appeared about 1862, and consisted of pictures of robins, holly, etc.; since then highly artistic designs have been introduced, and their manufacture is considerable in the U. S., Germany, France, and England. Immense quantities of them pass through the post office every Christmas.

Christmas Carol, a carol or song descriptive of the birth of Christ, or of incidents connected with it, sung specially at Christmas.

Christmas Rose, the black hellebore, so called from its flower, which resembles a large white rose. Its foliage is dark and evergreen, and the plant blossoms during the winter months.

Christmas Tree, a small fir tree lighted up by means of tiny candles of colored wax, or small Chinese lanterns, ornamented with flags, tinsel ornaments, etc., and hung all over with gifts for children.

Christophe (kris-tof), HENRI (1767–1820), king of Hayti, was b. in the West Indies, and was employed as a slave in St. Domingo on the outbreak of the blacks against the French in 1793. From the commencement of the troubles he signalized himself by his energy, boldness, and activity in many bloody engagements. Toussaint-L'Ouverture gave him the commission of brigadier general, and he was largely instrumental in driving the French from the island. After the death of Dessalines, Christophe became master of the northern part of the island. In 1811 he had himself proclaimed king of Hayti by the name of Henri I. He also sought to perpetuate the name by the compilation of the Code Henri—a digest founded upon the Code Napoleon. His cruelty provoked a revolt, which being unable to quell he shot himself.

Christopher's, ST., a British island in the West Indies, one of the Leeward Islands, 23 mi. in length, and in general about 5 in breadth; area 68 sq. mi. The interior consists of many rugged precipices and barren mountains. Of these the loftiest is Mount Misery (evidently an extinguished volcano), 4,100 ft. high. The chief town, a seaport with open roadstead, is Basse-Terre. The island has a legislature of its own, with an executive subordinate to the governor of the Leeward Islands, resident in Antigua. It was discovered by Columbus in 1493, and colonized by the English in 1623. Pop. 29,127.

Christ's College, one of the colleges of the University of Cambridge, England, founded originally by Henry VI, but remodeled and liberally endowed by Margaret, countess of Richmond and Derby, mother of Henry VII, in 1505.

Chromat'ic, in music, a term applied to notes and peculiarities not belonging to the diatonic scale. Thus a *chromatic chord* is a chord which contains a note or notes foreign to diatonic progression; *chromatic harmony,* harmony consisting of chromatic chords. The *chromatic scale* is a scale made up of thirteen successive semitones, that is, the eight diatonic tones and the five intermediate tones.

Chrome Iron Ore, an ore of chromium, is a mineral of very considerable importance as affording chromate of potash, whence are obtained various other preparations of this metal used in the arts.

Chrome Yellow, a chromate of lead, a beautiful pigment, varying in shade from deep orange to a very pale canary yellow, much used in the arts.

Chro'mium, a metal which forms very hard steel-gray masses; it never occurs native, but may be obtained by reducing the oxide. In its highest degree of oxidation it forms a compound of a ruby-red color. By itself it has received no practical applications. It takes its name from the various and beautiful colors which its oxide and acid communicate to minerals into whose composition they enter. It is the coloring matter of the emerald and beryl. Chromium is employed to give a fine, deep green to the enamel of porcelain, to glass, etc. The oxide of chromium is of a bright grass-green or pale yellow color. This element was originally discovered in 1797 by Vanquelin, in the native chromate of lead of Siberia. See preceding articles.

Chromo-lithography, a method of producing a colored or tinted lithographic picture, by using various stones having different portions of the picture drawn upon them with inks of various colors and so arranged as to blend into a complete picture. Sometimes as many as twenty different colors are employed. In printing, lighter shades are printed off first and the darkest last.

Chro'mosphere, the name given to the gaseous envelope which exists round the body of the sun, through which the light of the photosphere, an inner envelope of incandescent matter, passes. During total eclipses it had been observed that a red-colored envelope surrounded the sun, shooting up to great distances from the surface. It seems to have been first recognized by Secchi; and the projecting portions of it are commonly described as "red-colored protuberances" and "red flames." To this red envelope the name *chromosphere* was given by Mr. Lockyer. The light from it is much fainter than that from the photosphere; and till 1868, when M. Janssen and Mr. Lockyer almost simultaneously pointed out a method of viewing it, it was never seen except during eclipses. The chromosphere and its prominences, when examined with the telespectroscope, exhibits a spectrum of bright lines, due to incandescent gases. The most elevated portions consist entirely or almost entirely of hydrogen, the lightest of the gases. Lower down are found the gases or vapors of the heavier metals — of sodium, magnesium, barium, iron, and others. The lower the layer of the chromosphere examined the more densely is the spectrum filled with lines of metals, and in the prominences the red hydrogen flames tower high above all.

Chron'icles, Books of, two books of the Old Testament which formed only one book in the Hebrew canon, in which it is placed last. Its division into two parts is the work of the

Seventy. The Hebrew name means "acts of the days," and is thus much the same as our "journals." The title given to it by the Seventy was *Paraleipomena*, meaning "things omitted." The name Chronicles was given to it by Jerome. The book is one of the latest compositions of the Old Testament, and is supposed to have been written by the same hand as Ezra and Nehemiah. According to its contents the book forms three great parts: 1, genealogical tables; 2, the history of the reigns of David and Solomon; 3, the history of the kingdom of Judah from the separation under Rehoboam to the Babylonian captivity, with a notice in the last two verses of the permission granted by Cyrus to the exiles to return home and rebuild their temple. The Chronicles present many points of contact with the earlier scriptures, historical and prophetical, more especially, however, with the books of Samuel and of Kings.

Chron'ogram, a device by which a date is given in numeral letters by selecting certain letters of an inscription and printing them larger than the others, as in the motto of a medal struck by Gustavus Adolphus in 1632: ChrIstVs DVX; ergo trIVMphVs; where the values of C and the other capitals regarded as Roman numerals gives the required figure when added together.

Chron'ograph, the name given to various devices for measuring and registering very minute portions of time with extreme precision. Benson's chronograph is, in principle, a lever watch with a double secondhand, the one superimposed on the other. The outer end of the lowermost hand has a small cup filled with a black viscid fluid, with a minute hole at the bottom, while the corresponding end of the uppermost is bent down so as just to reach the hole. At the starting of a horse-race, the observer pulls a string, whereupon the bent end of the upper hand passes through the hole and makes a black mark on the dial, instantly rebounding. Again, as each horse passes the winning-post the string is redrawn and a dot made, and thus the time occupied by each horse is noted. This chronograph registers to one tenth of a second. Strange's chronograph is connected with the pendulum of an astronomical clock, which makes a mark on a sheet of paper at the beginning and end of each swing. By touching a spring on the appearance of a particular star in the field of a telescope, an additional dot is made intermediate between the two extreme ones, and by measuring the distance of this from either of these extremes the exact time can be ascertained to one hundredth of a second. Schultze's chronograph, in which electricity is applied, is yet far more precise, registering time to the five-hundred-thousandth part of a second.

Chronol'ogy, the science which treats of time, and has for its object the arrangement and exhibition of historical events in order of time and the ascertaining of the intervals between them. Its basis is necessarily the method of measuring or computing time by

regular divisions or periods, according to the revolutions of the earth or moon. The motions of these bodies produce the natural division of time into years, months, and days. As there can be no exact computation of time or placing of events without a fixed point from which to start, dates are fixed from an arbitrary point or *epoch*, which forms the beginning of an *era*. The more important of these are the creation of the world among the Jews; the birth of Christ among Christians; the Olympiads among the Greeks; the building of Rome among the Romans; the Hejira or flight of Mohammed among the Mohammedans, etc.

Chronom′eter, any instrument that measures time, as a clock, watch, or dial; but, specifically, this term is applied to those timekeepers which are used for determining the longitude at sea, or for any other purpose where an accurate measure of time is required, with great portability in the instrument. The chronometer differs from the ordinary watch in the principle of its escapement, which is so constructed that the balance is free from the wheels during the greater part of its vibration, and also in being fitted with a "compensation adjustment," calculated to prevent the expansion and contraction of the metal by the action of heat and cold from affecting its movements. Marine chronometers generally beat half seconds, and are hung in gimbals in boxes 6 or 8 in. square. The pocket chronometer does not differ in appearance from a watch except that it is somewhat larger.

Chronoscope, an instrument for measuring the duration of extremely short-lived phenomena, such as the electric spark; more especially the name given to instruments of various forms for measuring the velocity of projectiles.

Chrys′alis, a form which butterflies, moths, and most other insects assume when they change from the state of larva, or caterpillar, and before they arrive at their winged or perfect state. In the chrysalis form the animal is in a state of rest or insensibility, and exists without nutriment, the length of time varying with the species and season. During this period an elaboration is going on in the interior of the chrysalis, giving to the organs of the future animal their proper development.

Chrysan′themum, a large genus of composite plants consisting of herbs or shrubs with single, large-stalked, yellow flowers or with many small

Yellow Chrysanthemum.

flowers; the rays are sometimes white. Two species are common weeds in Britain, the oxeye daisy, a meadow plant with white ray flowers, and the corn marigold, a cornfield weed with golden-yellow ray-flowers. The chrysanthemum of gardens is a Chinese half shrubby plant whose numerous varieties constitute one of the chief ornaments of our American gardens in October, November, and December.

Chrys′olite, a mineral composed of silica, magnesium, and iron. Its prevailing color is some shade of green. It is harder than glass, but less hard than quartz; often transparent, sometimes only translucent. Very fine specimens are found in Egypt and Brazil, but it is not of high repute as a jeweler's stone.

Chrysophan′ic Acid, the yellow coloring matter of rhubarb. With potash it gives a fine, purple solution, and thus affords a delicate test for the presence of alkalies.

Chrys′ostom, John, St. (344–407) ("golden mouthed"), a celebrated Greek father of the church. He studied eloquence with Libanius, the most famous orator of his time, and soon excelled his master. After having studied philosophy with Andragathius he devoted himself to the Holy Scriptures, and determined upon quitting the world and consecrating his life to God in the deserts of Syria. He spent several years in solitary retirement, studying and meditating with a view to the church.

Chub, a European river fish, of the genus *Cyprīnus* or carps; or, as some regard it, of the sub-genus *Leuciscus*. The body is oblong, nearly round; the head and back green, the sides silvery, and the belly white. It frequents deep holes in rivers shaded by trees,

Chub.

but in warm weather floats near the surface, and furnishes sport for anglers. It is indifferent food, and rarely attains the weight of 5 lbs. Allied American species receive the same name.

Chuprah (or Chapra) (ch*a*p-rä), a town, Hindustan, division of Bahar, on the Gogra, about a mile above its confluence with the Ganges; extending along the river for nearly four miles, with an active trade in cotton, sugar, and saltpeter. Pop. 51,670.

Chuquisaca (chö-kē-sä′kä) (or Sucre), a city of South America, the capital of Bolivia; well situated on a plateau between the Amazon and La Plata rivers, 9,343 ft. above the sea level. It has a cathedral and a university. It was founded by one of Pizarro's officers in 1539. Pop. formerly 27,000, now est. 12,000. The province of Chuquisaca has an area of 72,796 sq. mi.; a pop. of 274,000.

Church, Frederic Edwin, American artist, b. in Hartford, Conn., May 4, 1826. He went to New York, and in 1849 was elected a mem-

ber of the National academy. In 1853–57 he traveled in South America. Later he went on an expedition to the coast of Labrador, and on his return painted his great picture *Icebergs*. He traveled through the West Indies, Europe, and Palestine in 1866. His best work was the *Great Fall at Niagara*. For many years he spent his winters in Mexico. He died April 7, 1900.

Church, a word which in its widest sense denotes the whole community of Christians, and was thus used by the New Testament writers. In more restricted significations it denotes a peculiar section of the Christian community differing in doctrinal matters from the remainder, as the Roman Catholic Church, the Protestant Church, etc.; or to designate the leading church of a nation, as the English, Scotch, or French Church. In yet another sense it signifies the edifice appropriated to Christian worship. After the conversion of Constantine the basilicæ or public halls and courts of judicature and some of the heathen temples were consecrated as Christian churches. When churches came to be specially built for Christian worship their forms were various — round, octagonal, etc. Later on the form with the cross aisle or transept became common. Early British churches were built of wood; the first stone churches erected being that of Whithorn, Galloway (sixth century), and that of York (seventh century). Any building set apart for religious ordinances is called a church, though when of a minor kind it is usually designated a *chapel*. The term church, however, is often restricted to the buildings for worship connected with a national establishment. They are classed as *cathedral*, when containing a bishop's throne; *collegiate*, when served by a dean and chapter; *conventual* or *minster*, when connected with a convent or monastery; *abbey* or *priory*, when under an abbot or prior; and *parochial*, when the charge of a secular priest.

Churchill, Charles (1731–1764), English poet and satirist. He was educated at Westminster School, but made so bad a use of his time that he was refused admission to the University of Oxford. An early and imprudent marriage was soon followed by his admission to holy orders and a Welsh curacy of $150 a year. On the death of his father he obtained his curacy of St. John's, Westminster; but owing to his love of gaiety he was soon overwhelmed with debt, and had to compound with his creditors. In 1761 he published anonymously a poem called *The Rosciad*, a clever satire on the chief actors of the day. Its success was increased by the vehemence with which the players replied to it, and Churchill seized the opportunity of giving the town a new satire, *The Apology*. A course of dissipation and intemperance followed, which excited much animadversion, and elicited from him his next satire, *Night*. Churchill now threw aside all regard for his profession, and became a complete man about town and a professional political satirist. His other productions include *The Ghost*, in which Dr. Johnson is satirized.

Churchill, Randolph Henry Spencer, Lord (1849–1895), second son of the sixth duke of Marlborough. Having entered Parliament in 1874, by 1884 he had risen to the position of a recognized leader of the Conservative party, and in 1885 became Indian secretary in Lord Salisbury's government. On the defeat of Gladstone's Irish Bill in 1886 Churchill became leader of the House of Commons and chancellor of exchequer, posts which he resigned in December, 1886.

Churchill River, a river of the Northwest Territories of Canada, which rises in La Crosse Lake, forms or passes through various lakes or lake-like expansions, the largest being Big or Indian Lake, and enters Hudson's Bay after a northeasterly course of about 800 mi. It is called also Missinippi or English River.

Churn, a vessel for preparing butter from cream or milk, in which cream is agitated to separate its buttery globules in a solid mass from the fluid portions. Churns are made of various forms; in a very common kind a perforated circular board is made to move up and down in a vessel containing the cream, and having the shape of the frustum of a cone by means of a long stalk or rod fixed to it, called the churn staff. In others the churning is performed by a circular motion.

Churubusco (chu-ru-bus'ko), a village 6 mi. s. of Mexico, the scene of a battle between the Mexicans under Santa Anna, and the U. S. troops under Scott, Aug. 20, 1847, in which the former were defeated.

Chusan Islands, a group of islands on the east coast of China, the largest in the archipelago having the name Chusan, and being about 21 mi. long, and from 6 to 11 broad. Pop. about 200,000. Chief town Ting-hae, pop. 40,000. Rice and tea are the principal products. From its situation near the mouths of the Yang-tse-kiang, which river forms the great channel of communication with the capital of the empire, Chusan is considered as the key to China, and was temporarily taken possession of by the British in 1840, 1841, and 1860. The sacred island of Pu-tu to the east of the above is covered with Buddhist temples, monasteries, etc., and is entirely inhabited by priests.

Chyme (kīm), food after it has been digested in the stomach. In the stomach it forms a pulpy mass which passes on into the small intestine, and being acted on by the bile, pancreatic fluid, and intestinal juice, is separated into chyle and non-nutritious matters, which latter are carried off by the evacuations.

Cialdini, Enrico, Italian soldier, b. in Modena Aug. 8, 1811; fought in the Austro-Italian War of 1849 and in the Crimea. In 1860 he defeated the Papal troops, and in 1861 took Gaeta and Messma. He became general of the army and viceroy of Naples, was made senator in 1864 and fought against the Austrians in 1866. In 1870 he annexed the States of the Church to Italy, and in 1876 became ambassador at Paris. He resigned the position in 1881. Died 1892.

Cibber, Colley (1671–1757), a dramatic writer and actor. He took to the stage in 1689. His first dramatic effort, *Love's Last Shift*, appeared in 1695: and it was followed by *Woman's Wit*, the *Careless Husband*, and the *Nonjuror*, of which the *Hypocrite* of the modern stage is a new version. A court pension and the appointment of poet-laureate drew upon him the rancor of the wits and poets of the day, including Pope.

Cica'da, the popular and generic name of certain insects belonging to the order Hemiptera, suborder Homopotera, of many species. The males have on each side of the body a kind of drum, with which they can make a considerable noise. This, regarded as the insect's song, was much admired by the ancients, and is frequently referred to by their poets. The largest European species are about an inch long, but some American species are much larger, and can be heard a mile off. They are nearly all natives of tropical or warm temperate regions.

Cicada.

Cicely (sis'e-li), a popular name applied to several umbelliferous plants. Sweet cicely, or sweet chervil, is a plant common to Britain and in other parts of Europe. It was formerly used in medicine, and in some parts of Europe is used as an ingredient in soups. Sweet cicely is found in our woods from Canada to Virginia.

Cicero, Marcus Tullius (b. c. 106–43), the greatest Roman orator. His family was of equestrian rank, and his father, though living in retirement, was a friend of some of the chief public men. He received the best education available. At the age of twenty-five he came forward as a pleader. He visited Greece b. c. 79, conversed with the philosophers of all the schools, and profited by the instruction of the masters of oratory. Here he formed that close friendship with Atticus of which his letters furnished such interesting evidence. He also made a tour in Asia Minor and remained some time at Rhodes, where he visited the most distinguished orators and took part in their exercises. On his return to Rome his displays of eloquence proved the value of his Grecian instruction, and he became one of the most distinguished orators in the forum. In b. c. 76 he was appointed quæstor of Sicily, and behaved with such justice that the Sicilians gratefully remembered him and requested that he would conduct their suit against their governor Verres. He appeared against this powerful robber, and the crimes of Verres were painted in the liveliest colors in his immortal speeches. Seven of the Verrine orations are preserved, but only two of them were delivered, and Verres went into voluntary exile. After this suit Cicero was elected to the office of ædile in b.c. 70, became prætor in 67, and consul in 63. It was now that he succeeded in defeating the conspiracy of Catiline, after whose fall he received greater honors than had ever before been bestowed upon a Roman citizen. He was hailed as the savior of the state and the father of his country, and thanksgivings in his name were voted to the gods. But Cicero's fortune had now reached the culminating point. The Catilinarian conspirators who had been executed had not been sentenced according to law, and Cicero, as chief magistrate, was responsible for the irregularity. Publius Clodius, the tribune of the people, raised such a storm against him that he was obliged to go into exile (b.c. 58). On the fall of the Clodian faction he was recalled to Rome, but he never succeeded in regaining the influence he had once possessed. In b. c. 52 he became proconsul of Cilicia, a province which he administered with eminent success. As soon as his term of office had expired he returned to Rome (January, b. c. 49), which was threatened with serious disturbances owing to the rupture between Cæsar and Pompey. He espoused the cause of Pompey, but after the battle of Pharsalia he made his peace with Cæsar, with whom he continued to all appearance friendly, and by whom he was kindly treated, until the assassination of the latter (44 b. c.). He now hoped to regain his political influence. The conspirators shared with him the honor of an enterprise in which no part had been assigned him, and the less he had contributed to it himself the more anxious was he to justify the deed and pursue the advantages which it offered. Antony having taken Cæsar's place, Cicero composed those admirable orations against him, delivered in b.c. 43, which are known to us by the name of *Philippics* (after the speeches of Demosthenes against Philip of Macedon). His implacable enmity towards Antony induced him to favor young Octavianus, who professed to entertain the most friendly feeling toward him. Octavianus, however, having possessed himself of the consulate, and formed an alliance with Antony and Lepidus, Cicero was proscribed. In endeavoring to escape from Tusculum, where he was living when the news of the proscription arrived, he was overtaken and murdered by a party of soldiers; and his head and hands were publicly exhibited in the forum at Rome. Cicero's eloquence has always remained a model. After the revival of learning he was the most admired of the ancient writers; and the purity and elegance of his style will always place him in the first rank of Roman classics. The life of Cicero was written by Plutarch, and there are modern lives by Middleton, Forsyth, and others. Cicero left a son of the same name by his wife Terentia. Young Marcus was b. in b.c. 65, was carefully educated, and distinguished himself in military service. In b. c. 30 Octavianus (Augustus) assumed him as his colleague in the consulship, and he was afterward governor of Asia or Syria. Cicero had also a daughter, Tullia, who d. in 45 b.c.

Cid, an epithet applied to Ruy or Roderigo Diaz, count of Bivar (1026–1099), the national

hero of Spain. He signalized himself by his exploits in the reigns of Ferdinand, Sancho, and Alphonso VI of Leon and Castile. His life appears to have been entirely spent in fierce warfare with the Moors, then masters of a great part of Spain.

Ci'der, a fermented liquor made from the expressed juice of apples. The apples are ground and crushed until they are reduced to a pulp, the juice is allowed to run into casks, where it is freely exposed to the air until fermentation takes place, when a clear liquor of a pale brown or amber color is the result.

Cienfuegos (thē-on-fü-gos), a seaport of Cuba, on the south coast of the island, with a safe and capacious harbor on the Bay of Jagua, 130 mi. s. e. of Havana, with which (and other towns) it is connected by railway. It is among the finest towns of the island, and exports sugar, wax, timber, etc., to the value of over $5-000,000 annually. Pop. 1899, 30,038.

Cigar (si-gär'), a small roll of manufactured tobacco leaves carefully made up, and intended to be smoked by lighting at one end and drawing the smoke through it. The choicest cigars are those made in and imported from Havana. Good cigars are made in the U. S. and elsewhere. Medicated cigars, or cigars made of some substance having remedial properties, are often used for certain complaints, as stramonium cigars for asthma. *Cheroots* are peculiarly shaped cigars much thicker at one end than the other, and are largely imported from Manilla.

Cignani (chē-nyä'nē), Carlo (1628–1719), Italian painter, the last great painter of the Bolognese school. His finest paintings are frescoes in the saloon of the Farnese Palace, Bologna, and in the cupola of the church of the Madonna del Fuoco at Forli. His paintings have been engraved by various artists.

Cil'ia, small, generally microscopic, hair-like organs or appendages, found on the surface of the tissues of most animals, and in some vegetable organisms, chiefly on tissues which are in contact with water, or which produce fluid secretions. They are constantly in active movement, and communicate to the fluid with which they are in contact a like motion.

Cilic'ia, in ancient geography, the region between Pamphylia and Syria, lying south of Mount Taurus. Alexander made Cilicia a Macedonian province; it then passed to the Syrians. Under Augustus it became an imperial province. It now forms the Turkish vilayet of Adana.

Cim'abue (chē-mäbö-ā), Giovanni (1240–1302), Italian painter, b. at Florence. Two Greek artists, who were invited to Florence to paint a chapel in the church of Santa Maria Novella, were his first masters. He is considered one of the chief restorers of the art of painting in Italy, which at that time had degenerated into mechanical conventionalism. His best paintings are in the church of Santa Maria Novella at Florence, and in the sacro convento at Assisi. Among his pupils was Giotto, whom he discovered drawing figures on the smooth surface of a rock while tending his sheep.

Cimbri (sim'brī), a tribe of ancient Europe, the origin of which is involved in obscurity They were regarded as Germans by the Romans, who gave the name of Chersonesus Cimbrica to what is now Jutland. Greek writers connected them with the Scythian Cimmerii of the Crimea; while modern writers suppose that they were Celtic, and that Cimbri is the same as the Cymri of Britain. In the second century B. C. they made formidable incursions into Gaul and Spain, but were finally routed by the Consul Marius at Vercelli B. C. 101.

Ci'mon, an ancient Athenian general and statesman. He fought against the Persians in the battle of Salamis (480 B.C.), and shared with Aristides the chief command of the fleet sent to Asia to deliver the Greek colonies from the Persian yoke.

Cinchona (sin-kō'na or sin-chō'na), an important genus of trees, type of the order Cinchonaceæ, which consists of gamopetalous, calycifloral dicotyledons, sometimes regarded

Cinchona.

as a sub-order of Rubiaceæ. They are trees, shrubs, or herbaceous plants, with simple opposite leaves, flowers arranged in panicles or corymbs; calyx adherent, entire or toothed; corolla regular; stamens attached to corolla; ovary two-celled; fruit inferior, dry, or succulent. They are found almost exclusively in the tropics, and many of the species are of great medicinal importance as tonics, febrifuges, emetics, and purgatives. From the wasteful method of cutting down the trees to get their bark it was believed that there would soon be a dearth of the valuable medicine, and hence cinchona plants were taken from their native regions and plantations formed in various tropical countries, so that Ceylon, India, Java, etc., are now important sources of Peruvian bark. The bark is taken off in strips longitudinally, and is in time renewed by natural growth.

Cincinnati, Hamilton co., O., on north bank of Ohio River, opposite the mouth of the Licking River. It is the second city in Ohio,

lying in a valley surrounded by hills, forming an amphitheater of great beauty. Railroads: The railroads entering the city number 24, the principal ones being B. & O.; C. Southern; Ohio & Mississippi; C. H. & D.; C. I. St. L. & C.; and C. & Marietta. The first railroad to the city was built in 1842. The Miami and Erie Canal, popularly termed the "Rhine" traverses the city in a southeast direction, and empties by an underground tunnel into the Ohio. Cincinnati is a port of entry and has some foreign commerce. The principal articles of export are whisky, cotton, tobacco, iron and steel. It is a great market for cotton. Principal industries are manufacture of liquor, clothing, meat products, candles, carriages, boots and shoes, furniture and iron. Among the prominent educational institutions are the University of Cincinnati, Wesleyan College, Hebrew College, two Roman Catholic colleges, and Lane Theological Seminary. The place was first settled about 1788 and was incorporated as a city in 1819. Pop. 1900, 325,908.

Cincinna'tus, LUCIUS QUINTIUS, a wealthy patrician in the early days of the Roman Republic, b. about 519 B.C. After violently opposing the passage of the Terentilian law for the equalization at law of patricians and plebeians, he succeeded Publicola in the consulship, and then retired to cultivate his small estate beyond the Tiber. Here, when Minucius was surrounded by the Æquians, the messengers of the senate found him at work when they came to summon him to the dictatorship. He rescued the army from its peril, marched to Rome laden with spoil, and then returned quietly to his farm. At the age of eighty he was again appointed dictator to oppose the ambitious designs of Spurius Mælius.

Cineraria.

Cinera'ria, a genus of plants consisting of herbs or small shrubs with small-sized heads of yellow flowers. They are chiefly found in South Africa, but a number of varieties have been much cultivated for garden purposes.

Cinna, LUCIUS CORNELIUS, an eminent man, an adherent of Marius, who, obtaining the consulship B. C. 87, along with Cneius Octavius, impeached Sulla and endeavored to secure the recall of Marius. Being driven from the city by Octavius, he rased the Italian cities, and invested Rome while Marius blockaded it from the sea. On its capture the friends of Sulla were massacred, and Cinna and Marius made themselves consuls (B.C. 86); but after the death of Marius the army refused to follow Cinna against Sulla, and put him to death in B.C. 84.

Cin'nabar, red sulphide of mercury, the principal ore from which that metal is obtained, occurring abundantly in California, Spain, China, etc. It is of a cochineal-red color, and is used as a pigment under the name of vermillion.

Cin'namon, the bark of the under branches of a species of laurel, which is chiefly found in Ceylon, but grows also in Malabar and other parts of the East Indies. The tree attains the height of 20 or 30 ft., has oval leaves, pale-yellow flowers, and acorn-shaped fruit. The Ceylonese bark their trees in April and November, the bark curling up into rolls or quills in the process of drying; the smaller quills being introduced into the larger ones. These are then assorted according to quality by tasters, and made up into bundles. An oil of cinnamon is prepared in Ceylon, but the oil of cassia is generally substituted for it; indeed, the cassia bark is often substituted for cinnamon, to which it has some resemblance, although in its qualities it is much weaker. The leaves, the fruit, and the root of the cinnamon plant all yield oil of considerable value; that from the fruit, being highly fragrant and of thick consistence, was formerly made into candles for the sole use of the king of Ceylon.

Cinnamon.

Cin'tra, a town, Portugal, 15 mi. w.n.w. Lisbon, finely situated on the slope of the Sierra de Cintra, and much resorted to by the wealthier inhabitants of Lisbon. The kings of Portugal have a palace with fine gardens at Cintra. The town is celebrated for the convention entered into there in 1808, by which the French, after their defeat at Vimeira, were conveyed to France. Pop. 4,751.

Circassi (or Tcherkessia), a mountainous region in the southeast of European Russia, lying chiefly on the north slope of the Caucasus, partly also on the south, and bounded on the west by the Black Sea, and now forming part of the lieutenancy of the Caucasus. The mountains of which the culminating heights are those of Mount Elbruz, are intersected everywhere with steep ravines and clothed with thick forests, and the territory is prin-

cipally drained by the Kuban and its tributaries. Its inhabitants are divided into several tribes speaking widely different dialects. While they retained their independence their government was of a patriarchal character, but every free Circassian had the right of expressing his opinion in the assemblies. They possessed traditional annals and laws. The duties of hospitality and vengeance were alike binding, and a Spartan morality existed in the matter of theft. Their religion, which is nominally Moslem, is in many cases a jumble of Christian, Jewish, and heathen traditions and ceremonies. As a race the Circassians are comely, the men being prized by the Russians as warriors, and the women by the Turks as mistresses, a position generally desired by the women themselves. Between the tenth and thirteenth centuries it formed a portion of the empire of Georgia, but in 1424 the Circassians were an independent people, and at war with the Tartars of the Crimea, etc., to whose khans, however, some were occasionally tributary. In 1705 the Tartars were defeated in a decisive battle, but shortly after, the territorial encroachment of the Russians on the Caucasian regions began, and in 1829 the country was formally annexed by them. A heroic resistance was made by the Circassians under their leader Schamyl, and on being reduced to submission numbers of the inhabitants emigrated to the Turkish provinces. In the north and east, however, tribes of the Circassian stock remain. The Circassians, properly so called, have been estimated to number from 500,000 to 600,000.

Circe (sėr-sē), a fabled sorceress of Greek mythology, who lived in the island of Ææa, represented by Homer as having converted the companions of Ulysses into swine after causing them to partake of an enchanted beverage. Ulysses, under the guidance of Hermes, compelled her to restore his companions, and afterward had two sons by her.

Circle is a plane figure contained by one line, which is called the *circumference*, and is such that all straight lines drawn from a certain point (the *center*) within the figure to the circumference are equal to one another. The properties of the circle are investigated in books on geometry and trigonometry. Properly, the curve belongs to the class of *conic sections*, and is a curve of the *second order*. A *great circle* of a sphere is one that has its center coinciding with that of the sphere. The celebrated problem of "squaring the circle" is to find a square whose area shall be equal to the area of any given circle. It is not possible to do so. All that can be done is to express *approximately* the ratio of the length of the circumference of the circle to the diameter, and to deduce the area of the figure from this approximation. If the diameter is called unity, the length of the circumference of the circle i 3.1415926535...; and the area of the circle i found by multiplying this number by the square of the radius. Thus the area of a circle of 2 ft. radius is 3.14159x4, or 12.56636 sq. ft. approximately. For trigonometrical calculations the circumference of the circle is divided into 360 equal parts called degrees, each degree is divided into 60 minutes, and each minute into 60 seconds.

Circuit Courts, a term applied distinctively to a class of the Federal courts of the U. S., of which terms are held in two or more places successively in the various circuits into which the country is divided for the purpose.

Circular Notes, notes or letters of credit furnished by bankers to persons about to travel abroad. Along with the notes the traveler receives a "letter of indication" bearing the names of certain foreign bankers who will cash such notes on presentation, in which letter the traveler must write his name. On presentation the foreign banker can demand to see the letter of indication, and by causing the presenter to write his name can compare the signature thus made with that in the letter. and so far satisfy himself as to the identity of the person presenting the note.

Circulation, in an organism, the flowing of sap or blood through the veins or channels, by means of which the perpetual and simultaneous movements of composition and decomposition manifested in organic life are carried on. Although Galen, who had observed the opposite directions of the blood in the arteries and veins, may be said to have been upon the very point of discovering the circulation, the discovery was reserved for William Harvey, who in 1628 pointed out the continuity of the connections between the heart, arteries, and veins, the reverse directions taken by the blood in the different vessels, the arrangements of valves in the heart and veins so that the blood could flow only in one direction, and the necessity of the return of a large proportion of blood to the heart to maintain the supply. In 1661 Malpighi exhibited microscopically the circulation in the web of a frog's foot, and showed that the blood passed from arteries to veins by capillaries or intermediate vessels. This finally established the theory with regard to animals, but the movements of sap in vegetables were only traced with difficulty and after numerous experiments. Many physiologists indeed are still disposed to refuse the term "circulation" to this portion of the economy of plants; but though sap, unlike the blood, does not exhibit movements in determinate vessels to and from a common center, a definite course is observable. In the stem of a dicotyledonous tree, for example, the sap describes a sort of circle, passing upward from the roots through the newer woody tissue to the leaves, where it is elaborated under the action of air and light; ar[illegible] thence descending through the bark to[illegible] the root, where what remains of it is [illegible]er excreted or mixed with the new fluid, [illegible]ering from the soil for a new period of [illegible]culation. In infusorial animalcules the movement of the fluids of the body is maintained by that of the animal itself and by the disturbing influence of nutritive absorption. In the Cœlenterata the movement receives aid besides from the action of cilia on the inner

walls of the body. The Annelids, as the earthworm, possess contractile vessels traversing the length of the body. The insects, crustaceans, Myriapods, and spiders have a dorsal tube, a portion of which may be specially developed as a heart. The blood is driven to the tissues, in some cases along arterial trunks, being distributed not in special vessels, but simply through the interstices of the tissues. From the tissues it is conveyed, it may be by special venous trunks, to a venous sinus which surrounds the heart and opens it by valvular apertures. The Mollusca have the heart provided with an auricle and a ventricle, as in the snail and whelk; two auricles, one on either side of the ventricle, as in the fresh-water mussel: or two auricles and two ventricles, as in the ark-shells. Among the ascidians, which stand low in that division of animals to which the molluscs belong, the remarkable phenomenon is encountered of an alternating current, which is rhythmically propelled for equal periods in opposite directions. All vertebrated animals have a heart, which in most fishes consists of an auricle and ventricle, but in the mudfishes there are two auricles and one ventricle; and this trilocular heart is found in the amphibians, and in most reptiles except the crocodiles, which, like birds and mammals, have a four-chambered organ consisting of two auricles and two ventricles. In these two last-named classes the venous and arterial blood are kept apart; in the trilocular hearts the two currents are mixed in the ventricle.

Circumnav'igators, a term usually applied to the early navigators who sailed the globe. Magellan, a Portuguese in the service of Spain, headed the first expedition which succeeded in circumnavigating the globe, though he did not live to complete the voyage. He sailed with five ships from San Lucar, Sept. 20, 1519, passed the straits named after him in November, 1520, and was killed in the Philippine Islands in April, 1521, Juan Sebastian del Cano continuing the voyage and reaching San Lucar with the only remaining ship in September, 1522. The principal early navigators, after Magellan, who succeeded in making the voyage round the globe were Grijalva and Alvaradi (Spaniards), 1537; Mendana (Spanish), 1567; Drake (English), 1577–80; Cavendish, 1586–88; Le Maire (Dutch), 1615–17; Quiros (Spanish), 1625; Tasman (Dutch), 1642; Cowley, 1683; Dampier, 1689; Cooke, 1708; Clipperton, 1719; Roggewein (Dutch), 1721–23; Anson, 1740–44; Byron, 1764–66; Wallis, 1766–68; Carteret, 1766–69; Bougainville, 1766–69; Cook, 1768–71; and Portlocke, 1788.

Cir'cus, among the Romans, a nearly oblong building without a roof, in which public chariot-races and exhibitions of pugilism and wrestling, etc., took place. It was rectangular except that one short side formed a half-circle, and on both sides, and on the semicircular end, were the seats of the spectators, rising gradually one above another, like steps. On the outside the circus was surrounded with colonnades, galleries, shops, and public places. The largest of these buildings in Rome was the *Circus Maximus*, capable, according to Pliny, of containing 260,000, and according to Aurelius Victor, 385,000 spectators. At present, however, but few vestiges of it remain, and the circus of Caracalla is in the best preservation. The games celebrated in these structures were known collectively by the name of *ludi circenses*, circensian games, or games of the circus, which under the emperors attained the greatest magnificence. The principal games of the circus were the Roman or Great Games which were celebrated from September 4–14, in honor of the *great gods*, so called. The passion of the common or poorer class of people for these shows appears from the cry with which they addressed their rulers: "Bread and the games!" The festival was opened by a splendid procession, or *pompa*, in which the magistrates, senate, priests, augurs, vestal virgins, and athletea, took part, carrying with them the images of the great gods, the Sibylline books, and sometimes the spoils of war. On reaching the circus the procession went round once in a circle, the sacrifices were performed, the spectators took their places, and the games commenced. These were: 1, Races with horses and chariots, in which men of the highest rank engaged. 2, The gymnastic contests. 3, The Trojan games, prize contests on horseback, revived by Julius Cæsar. 4, The combats with wild beasts, in which beasts fought with beasts or with men, criminals or volunteers. 5, Representations of naval engagements, for which purpose the circus could be laid under water. The expense of these games was often immense. Pompey, in his second consulship, brought forward 500 lions at one combat of wild beasts, which, with eighteen elephants, were slain in five days.

The *modern circus* is a place where horses are trained to perform antics, and where exhibitions of acrobats and various pageantries, including a large amount of buffoonery, are represented.

Cisalpine Republic, a state set up in 1797 by Napoleon I in North Italy, recognized by Germany as an independent power at the Peace of Campo-Formio. It comprised Austrian Lombardy, together with the Mantuan and the Venetian provinces, Bergamo, Brescia, Crema, Verona, and Rovigo, the duchy of Modena, the principality of Massa and Carrara, Bologna, Ferrara, and Romagna, and latterly its area was 16,337 sq. mi.; its pop. 3,500,000. The legislative body held its sessions in Milan. On Jan. 25, 1802, it received the name of the *Italian Republic;* from 1805 to 1814 it formed part of the kingdom of Italy; and it was given to Austria by the Congress of Vienna in 1815 as the Lombardo-Venetian kingdom.

Cithæ'ron (the modern Elatéa), a mountain of Greece, which, stretching northwest, separates Bœotia from Megaris and Attica. Its loftiest summit is 4,620 ft. in height.

Cities of Refuge, six out of the forty-eight cities given to the tribe of Levi in the division of Canaan, set apart by the law of Moses as places of refuge for the manslayer or accidental homicide. Their names were Kedesh,

Shechem, and Hebron on the west side of Jordan; and Bezer, Ramoth-Gilead, and Golan on the east.

Cities of the United States in 1900.—The 1900 census returns gave the population of 159 cities in the United States having 25,000 inhabitants or more. These cities combined had a population of 19,694,625, as compared with a population for the same cities of 14,855,489 in 1890, and of 9,933,927 in 1880.

The combined population of these cities in 1900 was 26.4 per cent of the total population of the United States. The absolute increase in the population of these cities from 1890 to 1900 was 4,839,136 or 82,426 less than the absolute increase from 1880 to 1890, when it was 4,921,562. The percentage of increase in population of the 159 cities from 1890 to 1900 was 32.5 as against 49.5 from 1880 to 1890.

Cities.	Rank.	1900	Rank.	1890	Per Cent of Increase
New York, N. Y.	1	3,437,202	1	2,492,591	37.8
Chicago, Ill.	2	1,698,575	2	1,099,850	54.4
Philadelphia, Pa.	3	1,293,697	3	1,046,964	23.5
St. Louis, Mo.	4	575,238	4	451,770	27.3
Boston, Mass	5	560,892	5	448,477	25.0
Baltimore, Md.	6	508,957	6	434,439	17.1
Cleveland, Ohio	7	381,768	9	261,353	46.0
Buffalo, N. Y.	8	352,387	10	255,664	37.8
San Francisco, Cal.	9	342,782	7	298,997	14.6
Cincinnati, Ohio	10	325,902	8	296,908	9.7
Pittsburg, Pa.	11	321,616	12	238,617	34.7
New Orleans, La.	12	287,104	11	242,039	18.6
Detroit, Mich.	13	285,704	14	205,876	38.7
Milwaukee, Wis.	14	285,315	15	204,468	39.5
Washington, D. C.	15	278,718	13	230,392	20.9
Newark, N. J.	16	246,070	16	181,830	35.3
Jersey City, N. J.	17	206,433	18	163,003	26.6
Louisville, Ky.	18	204,731	19	161,129	27.0
Minneapolis, Minn.	19	202,718	17	164,738	23.0
Providence, R. I.	20	175,597	24	132,146	32.8
Indianapolis, Ind.	21	169,164	26	105,436	60.4
Kansas City, Mo.	22	163,752	23	132,716	23.3
St. Paul, Minn.	23	163,065	22	133,156	22.4
Rochester, N. Y.	24	162,608	21	133,896	21.4
Denver, Colo.	25	133,859	25	106,713	25.4
Toledo, Ohio	26	131,822	32	81,434	61.8
Allegheny, Pa.	27	129,896	27	105,287	23.3
Columbus, Ohio	28	125,560	29	88,150	42.4
Worcester, Mass.	29	118,421	31	84,655	39.8
Syracuse, N. Y.	30	108,374	30	88,143	22.9
New Haven, Conn.	31	108,027	34	81,298	32.8
Paterson, N. J.	32	105,171	35	78,347	34.2
Fall River, Mass.	33	104,863	39	74,398	40.9
St. Joseph, Mo.	34	102,979	54	52,324	96.8
Omaha, Neb	35	102,555	20	140,452	*26.9
Los Angeles, Cal.	36	102,479	56	50,395	103.3
Memphis, Tenn.	37	102,320	42	64,495	58.6
Scranton, Pa.	38	102,026	38	75,215	35.6
Lowell, Mass.	39	94,969	36	77,696	22.2
Albany, N. Y.	40	94,151	28	94,923	*0.8
Cambridge, Mass.	41	91,886	40	70,028	31.2
Portland, Ore.	42	90,426	60	46,385	94.9
Atlanta, Ga	43	89,872	41	65,533	37.1
Grand Rapids, Mich.	44	87,565	46	60,278	45.2
Dayton, Ohio	45	85,333	44	61,220	39.3
Richmond, Va.	46	85,050	33	81,388	4.4
Nashville, Tenn.	47	80,865	37	76,168	6.1
Seattle, Wash.	48	80,671	69	42,837	88.3
Hartford, Conn.	49	79,850	53	53,230	50.0
Reading, Pa	50	78,961	47	58,661	34.6
Wilmington, Del.	51	76,508	43	61,431	24.5
Camden, N. J.	52	75,935	48	58,313	30.2
Trenton, N. J.	53	73,307	49	57,458	27.5
Bridgeport, Conn.	54	70,996	58	48,866	45.2
Lynn, Mass.	55	68,513	50	55,727	22.9

Cities of the United States in 1900

Cities.	Rank.	1900	Rank.	1890	Per Cent of Increase.
Oakland, Cal.	56	66,960	59	48,682	37.5
Lawrence, Mass.	57	62,559	63	44,654	40.0
New Bedford, Mass.	58	62,442	71	40,733	53.2
Des Moines, Iowa	59	62,139	57	50,093	24.0
Springfield, Mass.	60	62,059	64	44,179	40.4
Somerville, Mass	61	61,643	73	40,152	53.5
Troy, N. Y.	62	60,651	45	60,954	*0.5
Hoboken, N. J.	63	59,364	67	43,648	36.0
Evansville, Ind.	64	59,007	55	50,756	16.2
Manchester, N. H.	65	56,987	65	44,126	29.1
Utica, N. Y.	66	56,383	66	44,007	28.1
Peoria, Ill.	67	56,100	70	41,024	36.7
Charleston, S. C.	68	55,807	52	54,955	1.5
Savannah, Ga.	69	54,244	68	43,189	25.5
Salt Lake City, Utah.	70	53,531	62	44,843	19.3
San Antonio, Tex.	71	53,321	80	37,673	41.5
Duluth, Minn	72	52,969	91	33,115	59.5
Erie, Pa.	73	52,733	72	40,634	29.7
Elizabeth, N. J.	74	52,130	78	37,764	38.0
Wilkesbarre, Pa.	75	51,721	79	37,718	37.1
Kansas City, Kan.	76	51,418	75	38,316	34.1
Harrisburg, Pa.	77	50,167	74	39,385	27.3
Portland, Me.	78	50,145	82	36,425	37.6
Yonkers, N. Y.	79	47,931	92	32,033	49.6
Norfolk, Va.	80	46,624	87	34,871	33.7
Waterbury, Conn.	81	45,859	105	28,646	60.0
Holyoke, Mass.	82	45,712	84	35,637	28.2
Fort Wayne, Ind.	83	45,115	85	35,393	27.4
Youngstown, Ohio.	84	44,885	90	33,220	35.1
Houston, Tex	85	44,633	110	27,557	61.9
Covington, Ky.	86	42,938	81	37,371	14.8
Akron, Ohio.	87	42,728	109	27,601	54.8
Dallas, Tex.	88	42,638	76	38,067	12.0
Saginaw, Mich.	89	42,345	61	46,322	*8 5
Lancaster, Pa.	90	41,459	93	32,011	29.5
Lincoln, Neb.	91	40,169	51	55,154	*27.1
Brockton, Mass.	92	40,063	112	27,294	46.7
Binghamton, N. Y.	93	39,647	86	35,005	13.2
Augusta, Ga.	94	39,441	89	33,300	18.4
Pawtucket, R. I.	95	39,231	108	27,633	41.9
Altoona, Pa	96	38,973	100	30,337	28.4
Wheeling, W. Va.	97	38,878	88	34,522	12.6
Mobile, Ala.	98	38,469	96	31,076	23.7
Birmingham, Ala.	99	38,415	117	26,178	46.7
Little Rock, Ark.	100	38,307	118	25,874	48.0
Springfield, Ohio.	101	38,253	94	31,895	19.9
Galveston, Texas.	102	37,789	104	29,084	29.9
Tacoma, Wash.	103	37,714	83	36,006	4.7
Haverhill, Mass.	104	37,175	111	27,412	35.6
Spokane, Wash.	105	36,848	146	19,922	84.9
Terre Haute, Ind.	106	36,673	102	30,217	21.3
Dubuque, Iowa.	107	36,297	101	30,311	19.7
Quincy, Ill	108	36,252	95	31,494	15.1
South Bend, Ind.	109	35,999	136	21,819	64.9
Salem, Mass	110	35,956	99	30,801	16.7
Johnstown, Pa.	111	35,936	137	21,805	64.8
Elmira, N. Y.	112	35,672	98	30,893	15.4
Allentown, Pa.	113	35,416	121	25,228	40.3
Davenport, Iowa.	114	35,254	114	26,872	31.1
Mc Keesport, Pa.	115	34,227	144	20,741	65.0
Springfield, Ill.	116	34,159	123	24,963	36.8
Chelsea, Mass.	117	34,072	106	27,909	22.0
Chester, Pa.	118	33,988	145	20,226	68.0
York, Pa.	119	33,708	143	20,793	62.1
Malden, Mass.	120	33,664	131	23,031	46.1
Topeka, Kan.	121	33,608	97	31,207	8.3
Newton, Mass.	122	33,587	127	24,379	37.7
Sioux City, Iowa.	123	33,111	77	37,806	*12.4
Bayonne, N. J.	124	32,722	148	19,033	71.9
Knoxville, Tenn.	125	32,637	133	22,535	44.8
Chattanooga, Tenn.	126	32,490	103	29,100	11.6
Schenectady, N. Y.	127	31,682	147	19,902	59.1
Fitchburg, Mass.	128	31,531	134	22,037	43.0
Superior, Wis.	129	31,091	156	11,983	159.4
Rockford, Ill.	130	31,051	128	23,584	31.6
Taunton, Mass.	131	31,036	120	25,448	21.9
Canton, Ohio.	132	30,667	116	26,189	17.0
Butte, Mont.	133	30,470	158	10,723	184.1
Montgomery, Ala.	134	30,346	135	21,883	38.6
Auburn, N. Y	135	30,345	119	25,858	17.3
East St. Louis, Ill.	136	29,655	152	15,169	95.4
Joliet, Ill.	137	29,353	129	23,264	26.1

Cities.	Rank.	1900	Rank.	1890	Per Cent of Increase.
Sacramento, Cal.....	138	29,282	115	26,386	10.9
Racine, Wis.....	139	29,102	140	21,014	38.4
La Crosse, Wis.....	140	28,895	122	25,090	15.1
Williamsport, Pa.....	141	28,757	113	27,132	5.9
Jacksonville, Fla.....	142	28,429	150	17,201	65.2
Newcastle, Pa.....	143	28,339	157	11,600	144.3
Newport, Ky.....	144	28,301	124	24,918	13.8
Oshkosh, Wis.....	145	28,284	132	22,836	23.5
Woonsocket, R. I.....	146	28,204	141	20,830	35.4
Pueblo, Colo.....	147	28,157	126	24,558	14.6
Atlantic City, N. J....	148	27,838	154	13,055	113.2
Passaic, N. J.....	149	27,777	155	13,028	113.2
Bay City, Mich.....	150	27,628	107	27,839	*0.7
Fort Worth, Tex	151	26,688	130	23,076	15.6
Lexington, Ky.....	152	26,369	138	21,567	22.2
Gloucester, Mass.....	153	26,121	125	24,651	5.9
South Omaha, Neb...	154	26,001	159	8,062	222.5
New Britain, Conn ...	155	25,998	151	16,519	57.3
Council Bluffs, Iowa .	156	25,802	139	21,474	20.1
Cedar Rapids, Iowa ..	157	25,656	149	18,020	42.3
Easton, Pa	158	25,238	153	14,481	74.2
Jackson, Mich.....	159	25,180	142	20,798	21.0

*Decrease.

Citric Acid, the acid of lemons, limes, and other fruits. It is generally prepared from lemon-juice, and when pure is white, inodorous, and extremely sharp in its taste. In combination with metals it forms crystalline salts known as citrates. The acid is used as a discharge in calico printing and as a substitute for lemon in making beverages.

Cit'ron, a small evergreen shrub yielding a fruit which is candied with sugar. The rind is considered superior to the pulp; it is imported in a preserved state, and is used in confectionery.

Cit'rus, an important genus of trees, nat. order Aurantiacæ, or that of the orange, characterized by simple ovate acuminate leaves or leaflets united by a distinct joint to the leaf-like stalk; by having the stamens united by their filaments into several irregular bundles, and by yielding a pulpy fruit with a spongy rind. *Citrus Medica* is the citron. Other species are the lemon, the sweet orange, the shaddock, and the forbidden fruit, sometimes used as an ornamental addition to dessert. The genus *Citrus* furnishes the essential oils of orange and lemon peels, of orange flowers, of citron peel, of bergamot, and oil of orange leaves—all much esteemed in perfumery.

City, in a general sense, a town holding, from extent of population, favorable situation, or other causes, a leading place in the community in which it is situated. Popularly, also, it is used, both in Britain and in France, to designate the old and central nucleus as distinguished from the suburban growths of large towns. The ecclesiastical sense of the term city is a town which is, or has been, the see of a bishop. This seems to be the historical use of the term in England, and still possesses some authority there, but to a considerable extent it has been superseded by the wider one. In America the application of the term is dependent upon the nature and extent of the

municipal privileges possessed by corporations and a town is raised to the dignity of a city by special charter. Generally the term implies the existence of a mayor at the head of the municipality.

Ciudad-Real (thi-ö-*đåd*-rā-âl') ("royal town") a town of Spain, capital of the province of same name, on a low plain near the Guadiana, 100 mi. s. of Madrid. The principal edifice is the church of Santa Maria, a magnificent structure, though consisting only of a single nave. Pop. 13,801. The province occupies the south extremity of New Castile, between the parallel ranges of the Sierra Toledo and Sierra Morena. Area 7,940 sq. mi.; pop. 280,075.

Ciudad-Rodrigo (thi-ö-*đåd*-ro*d*-rē'gō) ("Roderick town"), a fortress in Spain, in Leon, on the river Aguada, was a place of considerable importance in the early Spanish history as a fortress on the Portuguese frontier, and was of some importance in the Peninsular War, being taken by storm by the British under Wellington, after a siege of eleven days. The Cortes gave Wellington the title of Duke of Ciudad-Rodrigo,

Civ'et, a genus of carnivorous mammals found in North Africa, and in Asia from Arabia to Malabar and Java, and distinguished by having a secretory apparatus in which collects the odoriferous fatty substance known as *civet.* The animal, which in form is intermediate between the weasel and the fox, and from 2 to 3 ft. long by 10 in. high, is of a cinereous color, tinged with yellow and marked

Civet.

by dusky spots disposed in rows. They are nocturnal, and prey upon birds and small animals, and may be considered as forming the transition from the musteline or marten kind to the feline race.

Civiliza'tion, the sum at any given time of the attainments and tendencies by which the human race or any section of it is removed from the savage state. The history of progress in civilization is usually presented from one of two points of view—the first conceiving the race as starting from a high civilization, to which in point of intellectual and moral power it has yet to return; the second viewing the

civilization of any period as the result of a constant and increasingly successful stream of effort upward from an origin comparable with the condition of the lower animals. The latter is the prevailing scientific theory, which finds the secret of progress in the interaction of function and environment. According to it primitive man, at first feeding on wild fruits and berries, and sheltering himself under overhanging rocks or caves, entered upon the stone age, in which, as the contemporary of the mammoth and cave bear, he made himself sharp-edged tools by chipping the flakes of flint found in the drift under gravel and clay. In the newer stone age he learned the art of polishing these rough implements, with which he cut down trees to make canoes, killed wild animals for food, and broke their bones for marrow, or shaped them into weapons. Fire he turned to account to hollow out trees, to cook his food, to fashion clay ware. Artificial means of shelter were constructed by piling rude huts of stones, by digging holes in the ground, or by driving piles into the beds of lakes and raising dwellings on them. The artistic instincts found expression in drawings of animals scratched upon bone or slate. The discovery of metals constituted a great step in advance. Gold and copper came early into use, and bronze was soon discovered, though a long time passed before iron was smelted and substituted for bronze where hardness was required. Gradually the roving savage became a nomadic shepherd and herdsman, or a tiller of the soil, according to his environment. The practise of barter was in part superseded by the beginnings of some sort of currency. Gesture language gave place in part to an enlarged vocabulary, and picture writing to the use of phonetic signs. In the meantime man had begun to question himself and the world on profounder issues, entering upon the myth-making age, in which was projected outward on the chief phenomena of nature some shadow of his own personality. The worship of the sun, moon, and stars, a faith in a future life, the worship of dead ancestors, fetiches, animals, etc., the belief in magic and witchcraft, all sprang into being. Prayer came spontaneously to him; the idea of propitiation by sacrifice would arise from his dealings with his fellows and his foes; the sacred books began to shape themselves. Tribal and national relations, arising from ties of family and exigencies of defense, were cemented by unity of faith, and the higher social unit began to perfect itself under the rule of the patriarch, the bravest warrior, etc. With varying needs, arising from diversity of environment, distinctions of nationality became more and more emphatic, and the history of civilization becomes the history of the nations viewed from the philosophic standpoint.

Civil Law, among the Romans the term nearly corresponding to what in modern times is implied by the phrase *positive law*, that is, the rules of right established by any government. They contradistinguished it from natural law (*jus naturāle*), by which they meant a certain natural order followed by all living beings; also from the general laws of mankind established by the agreement of all nations and governments (*jus gentium*). With the growth and multiplication of the edicts issued by the prætors (in whose hands was the supreme administration of justice) for the modification and extension of the positive enactments a further distinction became necessary, the whole prætorian law being known by the name of *jus honorarium* as opposed to the strict formal law (*jus civile*). The latter, however, included both the private law (*jus privātum*), which relates to the various legal relations of the different members of the state — the citizens — and the public law (*jus publicum*), that is, the rules respecting the limits, rights, obligations, etc., of the public authorities. The final digest of Roman law was made in the sixth century A. D. under the Emperor Justinian, but at first was only admitted as formally binding in a small part of Italy. After the eleventh century, in Upper Italy, particularly in the school of Bologna, the body of the Roman law, put together by Justinian, was formed by degrees into a system applicable to the wants of all nations; and on this model the ecclesiastical and papal decrees were arranged and to a considerable degree the native laws of the new Teutonic states. From all these the Roman law was distinguished under the name of *civil law*. In this sense, therefore, *civil law* means *ancient Roman law;* and it is contradistinguished from *canon law* and *feudal law*, though the feudal codes of the Lombards have been received into the *corpus juris civilis* or body of civil law. As the Roman code exerted the greatest influence on modern Europe, the expression *civil law* is also used to embrace all the rules relating to the private rights of citizens. Under the term *civil law*, therefore, in America and Europe, is to be understood not only the Roman law, but also the modern private law of the various countries; for example, in Germany, *Das gemeine Deutsche Privatrecht;* in France, the *Code civil des Français* or *Code Napoléon.* In this sense it is chiefly opposed to *criminal law*, particularly in reference to the administration of justice, which is to be divided into *civil justice* and *criminal justice.*

Civil Service.—Under this head are classed all officers who do not belong to the military or naval service, but are engaged in the administration of the civil affairs of the state, such as the collection of revenue, performance of executive duties of the government, and representation of the country abroad. Originally the civil service was a body small in number, but the number of persons employed under the government has vastly increased and new departments have been organized to carry out the laws of the states. It will readily be seen that the administration of such affairs calls for unbiased action and it should be done independent of any party. Its success, in fact, depends upon its being done wholly on business principles. General Jackson's statement that "to the victors belong the spoils" has

been, to a great extent, set aside in the civil service of the U. S. In the first year of his presidency 490 postmasters and 240 officials were removed.

Henry Clay wrote: "Among the official corps there is the greatest solicitude. The members of it feel something like the inhabitants of Cairo when the plague strikes it. No one knows who is next to encounter the stroke of death or, which with many of them is the same thing, to be dismissed from office."

In 1840 Horace Greeley wrote from Washington: "We have nothing new here in politics, but large and numerous swarms of office-hunting locusts sweeping into Washington daily; all the rotten land speculators, broken bank directors, swindling cashiers, etc., are in full cry for office, office; and even so humble a man as I am is run down by letters, letters."

General Grant, in 1872, undertook to suppress the evil of office seeking, and appointed a commission to make rules and regulations for admission to and continuance in the civil service. The rules reported, however, by this commission were never carried out to any considerable extent on account of the political pressure which was brought to bear on the members of Congress. President Hayes undertook to carry out Grant's plan, and a reform was noticed in several of the large post offices of the country. In January, 1883, Congress passed a law to prevent the abuse of the appointing power of the officers of the government. The president was authorized to appoint, with the advice and consent of the Senate, three civil service commissioners whose duty is to aid the president in preparing suitable rules which shall provide for open, competitive examinations, for testing the fitness of applicants for the public service, such examinations to be practical in their character, and so far as may be relating to those matters which will fairly test the relative capacity and fitness of the person examined, to discharge the duties of the service. All the offices, places, and employments ranged in classes or grades, are to be filled by selection according to grade from among those graded highest as the result of such competitive examination. Appointments to the public service in the departments at Washington are to be proportioned upon the basis of population to the several states. The law provides that all persons in the public service shall be exempted from any obligation to contribute to any political fund, or to render any political service. It forbids any person in the public service using his official authority to coerce the political action of any other person or body. Non-competitive examinations in all proper cases are provided for, after notice given of a vacancy. The appointing power should give notice in writing to the civil service commission, of the persons selected for appointment among those who have been examined. Power is given this commission to make regulations for, and have control of, such examinations subject to the rules made by the president. Provision is made for holding examinations at convenient places in every state and territory of the U. S. The commission punishes by fine and imprisonment all in the public service who willfully defeat, obstruct, or deceive any person in respect to his right of examination, or who shall corruptly or falsely mark, grade, estimate, or report upon the proper standing of any person examined, or aid in so doing, or who shall furnish to any person any special or secret information for the purpose of either improving or injuring the prospects of any person so examined being appointed, employed, or promoted. It further provides that no person in the habit of using intoxicating liquors is to be appointed to or retained in offices to which the act applies. Since the passage of this act, the system of competitive examinations has been extended, not only of the federal offices but also to the civil service in several of the states and the large cities.

Civil Service

Rules for federal appointments include the following:—

Applicants. — Applicants for examination must be citizens of the U. S., of the proper age. No discrimination is made on account of sex, color, or political or religious opinions. The limitations of age vary with the different services; but the age limitations do not apply to any person honorably discharged from the military or naval service of the U. S. by reason of disability resulting from wounds or sickness incurred in the line of duty. Everyone seeking to be examined must file an application blank. The blank for the Departmental, Railway Mail, Indian School, or Government Printing Office Service should be requested directly of the Civil Service Commission at Washington. The blank for the Customs, Postal, or Internal Revenue Service must be requested in writing by the persons desiring examination of the Customs, Postal, or Internal Revenue Board of Examiners at the office where service is sought. The service classified under the act, and to which it and the rules apply, embraces the employees in the Executive Departments at Washington, the employees at the Executive Mansion, and the employees at the Civil Service Commission, the Department of Labor, the Commission of Fish and Fisheries, the Interstate Commerce Commission, under the Superintendent of the State, War, and Navy Building, the Smithsonian Institution, the Library of Congress, and the Government Printing Office, the employees in the Weather Bureau, and all officers and employees of whatever designation, except persons merely employed as laborers or workmen, and persons whose appointments are subject to confirmation by the senate, however or for whatever purpose employed, whether compensated by a fixed salary, or otherwise, who are serving in, or on detail from, the several Executive Departments, the Commissions and offices in the District of Columbia, the Railway Mail Service, the Indian Service, the several Pension Agencies, the Steamboat Inspection Service, the Marine Hospital Service, the Light House Service, the Life Saving Service, the several

mints and assay offices, the Revenue Cutter Service, the force employed under custodians of public buildings, the several sub-treasuries, the Engineer Department at large, and the Ordnance Department at large, all executive officers and employees outside the District of Columbia of whatever designation, except persons merely employed as laborers or workmen, and persons whose appointments are subject to confirmation by the senate, whether compensated by a fixed salary, or otherwise, who are serving in a clerical capacity, or whose duties are in whole or in part of a clerical nature; who are serving in the capacity of watchman or messenger; who are serving in the capacity of physician, hospital steward, nurse, or whose duties are of a medical nature; who are serving in the capacity of draughtsman, civil engineer, steam engineer, electrical engineer, computer or fireman; who are in the service of the supervising architect's office in the capacity of superintendent of construction, superintendent of repair, or foreman; who are in the service of the Treasury Department, in any capacity; and who are employed in the Department of Justice under the annual appropriation for the investigation of official acts, records, and accounts of officers of the courts; all free delivery post offices, the Indian school, and agency service, the customs districts in each of which there are five or more employees, and the Internal Revenue service at large.

The applicants to enter the service designated are examined as to their relative capacity and fitness. The ordinary clerical examinations are used only in the Customs, Departmental, the Internal Revenue services for clerkships requiring no particular information or skill. They are limited to the following subjects: First, orthography, penmanship, and copying; second, arithmetic, fundamental rules, fractions, and percentage; third, interest and discount, elements of bookkeeping, and accounts; fourth, elements of the English language, letter writing, and the proper construction of sentences. For places in which a lower degree of education suffices, as for employees in post offices, compositors, and other trade employees, and those below the grade of clerks in customhouses, and in the Departments at Washington, the Commission limits the examination to less than these four subjects, omitting the third and parts of the fourth subject. The examinations relate as nearly as possible to the duties to be performed, and wherever applicable include experience and practical tests. No one is certified for appointment whose standing in the examination is less than 70 per cent. of complete proficiency, except that applicants claiming military or naval preference need obtain but 65 per cent. The law also prescribes competitive examinations to test the fitness of persons in the service for promotion therein. The Commission gives a certificate to the person examined, stating whether he passed or failed to pass.

Civil Service in Cities.—Civil service in the large cities is now, to a considerable extent,

Civil Service

under civil service laws. The most marked effect of the civil service laws in the cities has been to relieve the mayors and heads of departments from the pressure of applicants for office, thus leaving them free to attend to their more important public duties. It has also relieved city employees from the unfair burden of political assessment. No officer or employee can solicit or receive pay or be in any manner concerned in soliciting, receiving, or paying any assessment, subscription, or contribution for any party or political purpose whatever. Applications for admission to examination are made on blanks in a definite form and manner, and supported by such certificates of persons acquainted with the applicant as may be prescribed. Blanks for such applications are furnished by the civil service commission.

Every applicant must be a citizen of the U. S. and of good moral character, sound health, and physically able to perform the duties of the office applied for. The examinations are absolutely impartial, practical in their character, and intended to fairly test the relative capacity and fitness of the persons examined for the service which they seek to enter. No questions relating to political or religious opinions or affiliations are asked. Applicants must average not less than 70 per cent. of complete proficiency in the subjects of the examination. Physical examinations are made to determine the physical qualifications and health of the applicant, and each applicant is notified of the general average he has obtained, and any person who has failed to pass the examination cannot be re-examined within six months from date of his failure. All competitors who attain a general average of 70 per cent. or over, are eligible for appointment, and their names are enrolled in the order of general average upon proper registers. The names remain upon the register of eligibles for two years from date of enrollment. Any person whose name is on the register of eligibles may accept temporary appointment without losing his position on the register of eligibles. All promotion in the civil service, unless otherwise provided, is from grade to grade, and is made upon voluntary, open, competitive examinations.

The official service is divided into medical; civil engineers; clerical service, embracing copyists, clerks, pages, messengers, recorders, bookkeepers, stenographers, timekeepers, weighers, etc.; police service; electrical service; fire service; mechanical engineers; bridge employees; inspectors; janitors; elevator conductors; library service, etc. For examination in the medical service, applicants for position must be regular graduates of some reputable medical college, and have been actively engaged in the practise of medicine. In the clerical service, applicants for places are usually examined in handwriting, spelling, copying, fundamental rules of arithmetic, fractions, percentage, copying from rough draft, clear and correct statement, letter writing, etc. For police service applicants must

pass the physical test and examination in handwriting, spelling, copying, etc.

Civita Vecchia (chē-vē-tä-vek′i-à), one of the best seaports of Central Italy, lying in a barren and unhealthy district, 38 mi. n. w. Rome. It is a fortified naval port, and has an arsenal, shipyards, cathedral, etc. Pop. 11,330.

Clackman′nan, the smallest county of Scotland, containing little more than 47 sq. mi.

Claiborne, WILLIAM (1589–1676), a famous colonist. He was appointed, under the London Company, surveyor of the Virginia plantations. He arrived in Jamestown, and located in James City in October, 1621. Soon afterward he acquired an estate amounting to 45,000 acres. In 1625 he became secretary of state for the colony, and in 1628 was commissioned to make discoveries southward, and open trade with the Indians. He settled the Isle of Kent, and established a trading post, bought out the interest of the natives in that island, and induced many settlers to locate on his lands. When Lord Baltimore's first colony arrived at St. Marie's, in March, 1634, they claimed control over the Isle of Kent. The dispute was continued for many years, until Virginia, in 1776, released all claims to the territory of Maryland beyond the Potomac River. When Lord Baltimore's colony had been founded on St. Mary's River, trouble began between them and the party of Claiborne, and in course of time the latter's settlement on the Isle of Kent became a failure. Claiborne had become involved in serious difficulties, and in 1637 sailed for England. He bought Palmer's Island from the Indians, but was unable to maintain his right thereto. Claiborne was made treasurer of the colony of Virginia for life by King Charles I, on April 6, 1642. When the Cromwellian revolution began to make headway in Great Britain, Claiborne saw fit to join the Parliamentary party, and in 1651 was appointed a commissioner by Parliament to reduce Virginia and the plantations on Chesapeake Bay. An English expedition arrived in Virginia in 1652 and established a Roundhead government with Claiborne as secretary of state.

Claiborne, WILLIAM CHARLES COLE (1775–1817), governor of Louisiana. He was a member of the convention which prepared the state constitution of 1796, and in 1797 was elected to Congress, where he served two terms. In 1802 he was appointed governor of the territory of Mississippi, and in 1803, when Louisiana was bought from the French, he was appointed a commissioner with Gen. James Wilkinson to take possession of the new territory, of which he was made governor in 1804. When Louisiana was made a state in 1812, he was elected governor. In 1816 he was elected to the U. S. Senate but was prevented by impaired health from taking his seat.

Clairvoyance (that is "clear-seeing"), an alleged faculty by which certain persons in certain states, or under certain conditions, are said to be able to see things by some sort of mental or spiritual vision apart altogether from the sense of sight. It is claimed that clairvoyance is the result of a kind of natural

state of trance, or may be induced by mesmerism; and in evidence of its existence in ancient times, the utterances of prophets, sibyls, etc., have been adduced.

Clam, the popular name of certain bivalvular shellfish of various genera and species, e.g., the thorny clam, the yellow clam, the giant clam, the common clam of America, etc. The giant clam has the largest shell known, and the animal is used as food in the Pacific. The clam is a justly-esteemed table delicacy.

Clan, among the Highlanders of Scotland, consisted of the common descendants of the same progenitor, under the patriarchal control of a chief, who represented the common ancestor. The name of the clan was frequently formed of that of the original progenitor with the affix *mac* (son): thus the MacDonalds were the sons of Donald, and every individual of this name was considered a descendant of the founder of the clan, and a brother of every one of its members. The chief exercised his authority by right of primogeniture, as the father of his clan; the clansmen revered and served the chief with the blind devotion of children. The clans each occupied a certain portion of the country, and hostilities with neighboring clans were extremely common. Next in rank to the chief were a certain number of persons, commonly near relations of the chief, to whom portions of land were assigned, during pleasure or on short leases. Each of these usually had a subdivision of the clan under him, of which he was chieftain, subject, however, to the general head of the sept. The jurisdiction of the chiefs was not very accurately defined, and it was necessary to consult, in some measure, the opinions of the most influential clansmen and the general wishes of the whole body. It was latterly the policy of the government in Scotland to oblige the clans to find a representative of rank to become security at court for their good behavior; the clans who could not procure a suitable representative, or who were unwilling to do so, were called broken clans, and existed in a sort of outlawry. Few traces of this institution now remain, except such as have a merely sentimental character; thus all those who possess the same clan name may still talk of their "chief," though the latter have now neither land nor influence.

Clap′ham, a southern suburban district of London. Clapham Common is a fine open space of over 200 acres. Pop. 96,952.

Clap Net, a ground-net used by bird catchers, consisting of two equal parts about 12 yards long by 2½ wide, and each having a slight frame. They are placed about four yards apart, and are pulled over by a string so as to enclose any birds on the intervening space.

Clap′perton, HUGH (1788–1827), African traveler, b. in Annan, Dumfriesshire. He became a lieutenant in the army in 1816. He then accompanied Doctor Oudney and Lieutenant Denham to Africa, where he remained till 1825. On his return to England Clapperton received the rank of captain, and immediately engaged in a second expedition, to start from

the Bight of Benin. Leaving Badagry, December, 1825, he penetrated to Katunga, within thirty miles of the Quorra or Niger, but was not permitted to visit it. At Soccatoo the Sultan Bello refused to allow him to proceed to Bornu, and detained him a long time in his capital. The disappointment preyed upon him, and he died, at Chungary, a village near Soccatoo. He was the first European who traversed the whole of Central Africa from the Bight of Benin to the Mediterranean.

Clare, a maritime county, Ireland, province Munster (capital, Ennis), between Galway Bay and the Shannon estuary; area 827,994 acres. Oats, potatoes, wheat, and barley are the principal crops. The chief minerals are limestone. lead, and slate, but the produce of the county is almost wholly agricultural. The salmon fisheries are valuable, and there are immense oyster beds in some places. Pop. 123,859.

Clare Island, an island of Ireland, county Mayo. It has a lofty lighthouse.

Claremont, Sullivan co., N. H., 48 mi. w. by n. of Concord. It is on the Concord & Claremont R. R., and near the Vermont Central. There is abundant water power which runs several paper, cotton, and woolen mills, forming the principal industries, Printing and bookbinding are also carried on to a considerable extent. The town was settled in 1762. Pop. 1900, 6,498.

Clar'ence, GEORGE, DUKE OF, son of Richard, duke of York, and brother of Edward IV, king of England. On his brother's accession, in 1461, he was created duke of Clarence, and in 1462 lord-lieutenant of Ireland, but afterward joined the disaffected Warwick and married his daughter. On the eve of battle he rejoined his brother, and was afterward involved in a quarrel with his brother Richard, who had married Warwick's younger daughter, about the inheritance of their father-in-law. On the death of his wife Clarence sought the hand of Mary of Burgundy, but Edward interposed and a serious breach ensued. A gentleman of the household of Clarence having at this time been condemned for using necromancy against the king, Clarence interfered with the execution of the sentence. He was impeached by the king in person, condemned in 1478, and secretly made away with in the tower. The tradition that he was drowned in a butt of malmsey wine is unsupported by evidence.

Clar'endon, CONSTITUTIONS OF, a code of laws adopted in the tenth year of Henry II (January, 1164), at a council of prelates and barons held at the village of Clarendon, Wiltshire. These laws, which were finally digested into sixteen articles, were brought forward by the king as "the ancient customs of the realm," and were enacted as such by the council, but they really involved a great scheme of administrative reform in the assertion of the supremacy of the state over clergy and laity alike. The power of the ecclesiastical courts was restricted, the crown secured the right of interference in elections to ecclesiastical offices, appeals to Rome were made dependent on the king's leave, ecclesiastical dignitaries were deprived of their freedom to leave the country without the royal permission, etc.

Clar'endon, EDWARD HYDE, EARL OF (1608–1674), lord high-chancellor of England, son of a private gentleman of Dinton, Wilts, where he was b. He commenced his political career in 1640 as member for Wootton Basset, and was again returned to the Long Parliament (November, 1640) by the borough of Saltash, at first acting with the more moderate of the popular party, but gradually separating himself from the democratic movement until, by the autumn of 1641, he was recognized as the real leader of the king's party in the House. Upon the breaking out of the civil war he joined the king at York, was knighted, made privy councilor, and appointed chancellor of the exchequer. In September, 1649, he joined Charles at The Hague, and was sent by him on an embassy to Madrid. Soon after his return he resumed the business of the exiled court. After Cromwell's death he contributed more than any other man to promote the Restoration, when he was placed at the head of the English administration. In 1660 he was elected chancellor of the University of Oxford, and in 1661 was created Baron Hyde, Viscount Cornbury, and earl of Clarendon. The marriage of the Duke of York with his daughter, Anne Hyde, confirmed for a time his power, but in 1663 Lord Bristol made an unsuccessful attempt to impeach him, his influence with the king declined, and his station as prime minister made the nation regard him as answerable for the ill success of the war against Holland, the sale of Dunkirk, etc. The king's displeasure deepened when his plan of repudiating his wife and marrying the beautiful Lady Stuart was defeated by Clarendon, who effected a marriage between this lady and the Duke of Richmond. The king deprived him of his offices, an impeachment for high treason was commenced against him, and he was compelled to seek refuge in Calais. He lived six years at Montpellier, Moulins, and Rouen, where he d. His remains were afterward removed to Westminster Abbey.

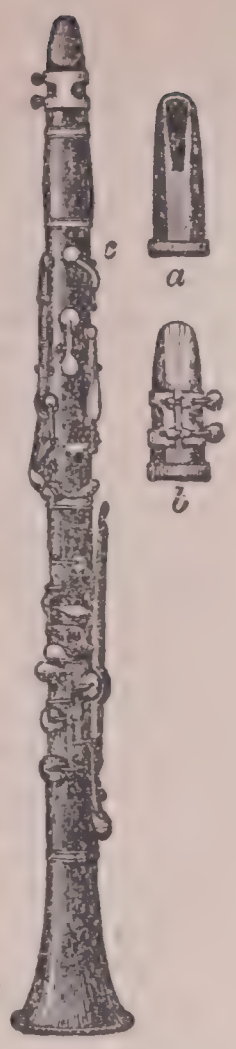
Clarifica'tion, or the separation of the insoluble particles that prevent a liquid from being transparent, may be performed by *depuration*, in which the liquid is allowed to stand until the particles are precipitated, and then decanted; by *filtration*, or straining through wood, sand, charcoal, etc.; or by *coagulation*, in which the albumen contained in or added to the liquid is solidified and precipitated by the action either of heat or of acids, the extraneous substances being precipitated with it.

Clar'inet (or clarionet), a wind instrument of the reed kind, played by holes and keys. Its lowest note is E below the F clef, from which it is capable, in the hands of good performers, of ascending more than three octaves. The keys of C and F, however, are those in which it is heard to most advantage, though there are B flat, A, D, B, and G clarinets.

Clark, ALVIN (1804–1887), b. in Ashfield, Mass. He and his son, Alvin Graham Clark,

became the leading manufacturers of object-glasses for telescopes, and made the 36-inch refractor for the Lick observatory.

Clark, ALVIN GRAHAM (1832–1897), was b. in Fall River, Mass. He was the son of Alvin Clark, and a descendant of Thomas Clark, who was one of the Pilgrims. He was educated in the public schools at Cambridge, and afterward learned the trade of a machinist. He subsequently worked with his brother George at lens making in East Cambridge, and became a member of the firm of Alvin Clark & Sons, telescope-makers, in 1852. Continuing in the work of making telescopes after the death of his father and brother, and retaining the firm name, he completed the celebrated 36-inch Lick telescope in 1887 and the Yerkes lens of 40 inches aperture for the University of Chicago. In addition to his work as manufacturer of telescopes he was also a practical astronomer, and as a result of his independent astronomical observation, discovered fourteen intricate double stars, among them the companion of Sirius, for which discovery the Lalande gold medal for 1862 was awarded him by the French Imperial Academy of Sciences.



Clarinet. *a.*—mouthpiece, back view, with reed removed; *b.*—the same with reed attached.

Clark, GEORGE ROGERS (1752–1818), American pioneer. He began life as a land surveyor, and commanded a company of militia in Lord Dunmore's war with the Indians. In 1772 he commanded a force of armed settlers in Kentucky. In December, 1877, Major Clark obtained permission and means from Virginia to attack the fort at Kaskaskia, which he captured on July 4, 1778. To retaliate an invasion of Kentucky by 600 Canadians and Indians, he destroyed an Indian town in Ohio in 1780. In the same year he went to Richmond to obtain approval from the authorities for his plans for the capture of Detroit, and while there took a command under Baron Steuben to defend Virginia against an invasion by a British force. In 1781 Clark became brigadier general. In 1782 he gathered a large force and marched against Indian towns on the Miami and Scioto, five of which were destroyed. About 1794 he accepted a commission as major general in the French army, to conduct an expedition against the Spanish possessions on the Mississippi, but when the French minister to the U. S., who gave him the commission, was recalled, this was annulled. General Clark's latter years were spent in poverty.

Clark, JAMES (1788–1870), a noted British physician. For many years he was physician in ordinary to Queen Victoria, by whom he was created a baronet. His chief works were treatises on the *Sanative Influence of Climate*, and on *Pulmonary Consumption and Scrofula*.

Clarke, CHARLES COWDEN (1787–1877), English writer. He was one of the minor members of the Shelley, Keats, and Leigh Hunt group. His publications include his *Hundred Wonders, Adam the Gardener, Shakespeare Characters, and Molière Characters.* He is best known, however, by the edition of Shakespeare which he annotated in conjuction with his wife, and by the *Shakespeare Key.*

Clarke, JAMES FREEMAN (1810–1888), American clergyman, b. in Hanover, N. H. After graduation at Harvard in 1829, and at the Cambridge divinity school in 1833, he became pastor of the Unitarian church in Louisville, Ky., serving from 1833 till 1840. From 1836 till 1839 he was editor of the *Western Messenger*, published in Louisville. Returning to Boston he founded in 1841, the Church of the Disciples, of which he was the pastor until 1886. This became one of the leading religious institutions of Boston. From 1867 till 1871 he was professor of natural religion and Christian doctrine in Harvard, and in 1876–7, lecturer there on ethnic religions. He was an overseer of Harvard, a member of the state board of education, and a trustee of the Boston public library. He was the author of several historical works and theological essays. He d. at Jamaica Plain, Mass.

Clarke, JOHN S., actor, b. in Maryland in 1835; began his theatrical career in 1852 in Philadelphia, and was speedily recognized as the best exponent of low comedy then on the boards. He starred the country for years, owned and managed theaters in Philadelphia and Boston, and from 1867 to 1870 played in England with great success.

Clarke's River, a river of the U. S., rising in the Rocky Mountains, and after a winding n.w. course of about 700 mi., falling into the Columbia, in Washington.

Clarksville, Montgomery co., Tenn., on Cumberland River, 60 mi. below Nashville. Railroad, Louisville & Nashville. It is the center of a productive tobacco-growing trade, with a very extensive trade in leaf and manufactured tobacco. The tobacco exchange handles about 100,000,000 pounds annually. Pop. 1900, 9,431.

Claude Lorraine (1600–1682), a landscape painter. When twelve years old he went to live with his brother, an engraver in wood at Friburg, went from him to study under Godfrey Waats at Naples, and was afterward employed at Rome by the painter Agostino Tassi, to grind his colors and do the household drudgery. On leaving Tassi he traveled in Italy, France, and Germany, but settled in 1627 in Rome, where his works were greatly sought for, and where he lived much at his ease until his death. The principal galleries of Italy, France, England, Spain, and Germany are adorned with his paintings.

Clau'dius, (or, in full, TIBERIUS CLAUDIUS DRUSUS NERO GERMANICUS) (B. C. 10–A. D. 54), a Roman Emperor, son of Claudius Drusus Nero, stepson of Augustus and Antonia, the

daughter of Augustus's sister. He lived in privacy, occupying himself with literature, the composition of a Roman history, and other works, until the murder of Caligula, when he was dragged from his hiding place and proclaimed emperor (41 A. D.). His reign was marked by the restoration of the exiles, the embellishment of Rome, and successes in Germany and Britain. But latterly he became debauched, left the government to his wives, and in particular to Messalina, who with his freedmen committed the greatest enormities. He was poisoned by his fourth wife, Agrippina (mother of Nero).

Clay, the name of various earths, which consist of hydrated silicate of aluminum, with small proportions of the silicates of iron, calcium, magnesium, potassium, and sodium. All the varieties are characterized by being firmly coherent, weighty, compact, and hard when dry, but plastic when moist, smooth to touch, not readily diffusible in water, but when mixed not readily subsiding in it. Their tenacity and ductility when moist and their hardness when dry has made them from the earliest times the materials of bricks, tiles, pottery, etc. Of the chief varieties *porcelain clay*, *kaolin*, or china clay, a white clay with occasional gray and yellow tones, is the purest. *Potter's clay* and *pipe clay*, which are similar but less pure, are generally of a yellowish or grayish color, from the presence of iron. Fire clay is a very refractory variety, always found lying immediately below the coal; it is used for making fire bricks, crucibles, etc. *Loam* is the same substance mixed with sand, oxide of iron, and various other foreign ingredients. The *boles*, which are of a red or yellow color from the presence of oxide of iron, are distinguished by their conchoidal fracture. The *ochres* are similar to the boles, containing only more oxide of iron. Other varieties are *fullers' earth*, *Tripoli*, and *boulder clay*, the last a hard clay of a dark brown color, with rounded masses of rock of all sizes embedded in it, the result of glacial action. The distinctive property of clays as ingredients of the soil is their power of absorbing ammonia and other gases and vapors generated on fertile and manured lands; indeed no soil will long remain fertile unless it has a fair proportion of clay in its composition. The best wheats are grown on calcareous clays, as also the finest fruits and flowers of the rosaceous kind.

Clay, Cassius Marcellus, American statesman; b. in 1810; graduated at Yale in 1832. He published in 1845 an abolitionist paper entitled *The True American*. His presses were seized by pro-slavery mobs, and he was threatened with assassination. He was a member of the Kentucky legislature in 1835, 1837, and 1840. During the Mexican War he was taken prisoner. In 1850 he ran as antislavery candidate for governor, but got few votes. In March, 1861, he was appointed minister to Russia. In June, 1862, he was commissioned major general of volunteers, but resigned the following March, and was again sent to St. Petersburg. In 1877 he shot and killed a negro who had threatened his life, and was tried and acquitted by a jury.

Clay, Henry (1777–1852), an American statesman; b. in Hanover co., Va. After acting as clerk in two or three state offices he commenced business in 1797 as a lawyer at Lexington, Ky. He soon became famous as a public speaker, and at the age of 26 was a member of the Kentucky legislature. In 1806 he was elected to the U. S. Senate; and in 1811 to the House of Representatives, where he was at once made speaker. In 1814 he proceeded to Europe and acted as one of the commissioners for adjusting the treaty of peace at Ghent between America and Great Britain. He was an unsuccessful candidate for the presidency in 1824, 1832, and 1844. He is best known for his endeavors to shut out European influences from America, and in connection with the "Missouri Compromise of 1820," restricting slavery to the states south of lat. 36° 30′ n.; and another similar compromise of 1850 regarding the admission of California, and establishment of territorial governments in New Mexico, Utah, etc. Clay was unquestionably one of the greatest orators America has produced; a splendid party chief, idolized by his followers.

Clay Slate, in geology, a rock consisting of clay which has been hardened and otherwise changed, for the most part extremely fissile and often affording good roofing slate. In color it varies from greenish or bluish gray to lead color.

Clayton, John Middleton (1796–1856), American jurist, b. in Sussex co., Del., educated at Yale, studied law, became U. S. senator, and secretary of state 1850; negotated treaty with England.

Clayton-Bulwer Treaty, a treaty between Britain and the U. S. concluded in 1850, and having reference to the construction of a ship canal across the Isthmus of Panama. Both parties agreed not to erect fortifications here, nor to acquire exclusive control of any part of the Central American territory.

Clayton, Powell, b. at Bethel, Pa., Aug. 7, 1833, and was educated at the Bristol Academy in Pennsylvania, later studying civil engineering at Wilmington, Del. In 1859 he was chosen engineer and surveyor of Leavenworth, Kan., and began his life in the West. At the beginning of the war he enlisted as captain of the First Kansas Infantry, and a year later was appointed lieutenant colonel of the Fifth Kansas Cavalry, in the same year, 1862, being made colonel. The greater part of his military service was carried on in Arkansas, where he led several minor expeditions, for which he was commissioned brigadier general, and where he settled as a planter at the close of the war. In 1868 he was elected governor of Arkansas, and from 1871 to 1877 was U. S. senator. In 1897 he was appointed minister to Mexico.

Clear, Cape, a promontory 400 ft. high at the southern extremity of Clear Island, and the most southern point of Ireland, about 7½ mi. s.e. of Baltimore, county Cork. Clear Island is about 3¼ mi. long and about 1 broad.

It is wild and romantic, and has a fishing population of over 1,000.

Clearing House, a place or institution where the settlement of mutual claims, especially of banks, is effected by the payment of differences called balances. In the earliest history of finance in the Old World experience showed the need and value of a discriminating and definite system of interchanging checks, notes, or other analagous evidences of indebtedness, whereby labor might be saved and the cash balances required in settlements reduced. The Lyons bourse, in France, had in 1667 a system similar in practise to our modern clearing-house, and the Scotch bank-note exchanges which existed as far back as 1752 were a species of clearing house. But the system, as it exists in this country to-day, originated in London, and in 1810 the Lombard Street Clearing House was established. The joint-stock banks were not admitted until 1854, and four years later the Country Check Clearing House was established. It was not until 1864 that the Bank of England was admitted into the association, and less than thirty banks in that great city are members to-day. The Vienna, Paris, and Berlin clearing houses were organized in 1864, 1872, and 1883 respectively, but the transactions of none of them are on a scale to compare with that of New York.

Albert Gallatin, one of the early secretaries of the treasury, suggested the adoption of a clearing house system in a pamphlet issued by him in 1831. He recognized the fact that those engaged in the business of banking, by standing together and thus building up mutual confidence, could to a large extent, prevent panics and sustain private credit, and, consequently, public credit as well. But his views were slow in finding approval, and it was many years before they were put in practise in this country. The first clearing house organized in America was started in New York City in the year 1853, and during the first year it did a business of $5,750,455,985. The Boston Clearing House was established in 1856, and that of Philadelphia in 1858. The Chicago Clearing House was organized in 1865, with nineteen members. Its ranks were greatly thinned during the trying financial period from 1873 to 1877, but at present its transactions, as compared with those of 1866, show an increase of 900 per cent.

The following description of the *modus operandi* of a clearing house will apply to all institutions of the kind in the U. S., as they are conducted without exception on the same general system:—

The clearings are made in a large room capable of holding without inconvenience several scores of persons. Each bank sends two representatives, a clerk and a messenger. Lengthwise of the room run two long rows of high desks, numbered from 1 to 40, or whatever the number of banks in the association is. Upon arriving at the clearing house a few minutes before 11 A. M., each clerk stations himself opposite the number of his bank, after having delivered a ticket at the manager's table, which

stands at the head of the double tier of desks. On each ticket respectively, is the total amount of checks brought by each bank. As each ticket is laid before the manager, he enters it to the credit of the bank sending it. He has before him a sheet ruled in four columns, one each for debit and credit amounts of exchanges, and for debit and credit balances. After the incoming tickets are entered and footed, the total represents the credit to all the banks clearing. The grand total brought by each bank is subdivided into say twenty other totals. These are represented by bundles of checks strapped together and marked with the amounts charged to the respective banks on which they are drawn, and which should be the sum of checks in each strap. As the gong strikes, the deputies assembled all bend their energies to the work in hand, for time is short, and there is much rapid figuring to be done in five minutes. A procession of messengers, each with a bag or an armful of bundles of checks, moves slowly up and down the outside of the double tier of desks. As they pass in front of each clerk, they deposit before him the checks drawn on the bank he represents. They pass from clerk to clerk a sheet upon which is entered the amount to the debit of each bank, and upon which the clerk receipts for checks so received, also entering upon a book before him the amount opposite the name of the bank delivering them. In about four minutes messenger No. 1 has reached the point from which he started, and each clerk has before him a double column of figures, one representing what he brought, the other what he takes away. The difference between the totals of the two col umns will of course be the balance. If the sum of what he brings exceeds that of what he carries away, he has a credit balance, and *vice versa*. As soon as he has rapidly footed the columns he fills out a ticket, the following being a sample:

Chicago, July 1, 1900.

No 1. Amount received.....$3,000,000
Amount brought..... 3,500,000

Debit—Bal. due Clearing-house .....
Credit—Bal. due National Bank..... 500,000

..... Settling Clerk.

The clerk then hastens with his ticket thus filled out to the manager's desk, who enters the *debtor* amount and balance in the proper column (the *credit* having been already entered). After all the clerks have handed in their tickets, the columns are added up, and if the "amount received" and "amount brought" agree, and the "Dr. balance" and "Cr. balance" also agree, the announcement "all right" is made. The clerks return to their several banks, and by 12:30 all debtor members must be on hand ready to pay in the amount due, and by 12:45 the creditors to collect. This operation is repeated every business day in the year.

Clearing Nut, a small tree of the same genus as the nux vomica, common in Indian forests. Its seeds being rubbed on the inside of a vessel

containing turbid water speedily precipitate the impurities, this result being due it is said to the clarifying effect of the albumin and casein they contain.

Cleavage, the manner or direction in which substances regularly cleave or split. The regular structure of most crystallized bodies becomes manifest as soon as they are broken. Each fragment presents the form of a small polyhedron, and the very dust appears under the microscope an assemblage of minute solids, regularly terminated. The directions in which such bodies thus break up are called their planes of cleavage; and the cleavage is called *basal*, *cubic*, *diagonal*, or *lateral*, according as it is parallel to the base of a crystal, to the faces of a cube, to a diagonal plane, or to the lateral planes. In certain rocks again there is a tendency to split along planes which may coincide with the original plane of stratification, but which more frequently cross it at an angle. This tendency is the consequence of the readjustment by pressure and heat of the components of rocks, which is one of the phases of metamorphism.

Cleburne, Johnson co., Tex., 28 mi. s. of Fort Worth. Railroad: Gulf Colorado & Santa Fé. Industries: railroad machine shops, flour mill, soda water, broom and cigar factories. Surrounding country agricultural. The town was first settled in 1850, and became a city in 1867. Pop. 1900, 7,493.

Cleef (klāf), 1, JOSEPH VAN, surnamed *the Fool* (1480–1529), b. at Antwerp, one of the most celebrated painters of his time, who in regard to beauty of coloring may challenge comparison with the Italian masters. 2, JOHN, a painter (1646–1716), belongs to the Flemish school, of which he is one of the most eminent masters. His works show more breadth of style than skill in coloring.

Clem'atis, a genus of woody climbing plants. The most common species, virgin's bower or traveler's joy, is conspicuous in the hedges both of England and the south of Scotland, first by its copious clusters of white

Clematis.

blossoms, and afterward by its feather-tailed silky tufts attached to the fruits. The fruit and leaves of the common clematis are acid and vesicant.

Clem'ens, SAMUEL LANGHORNE, an American humorist, b. in 1835, at Florida, Mo., more generally known by his pseudonym, "Mark Twain." He worked for some time as a compositor in Philadelphia and New York, and then in 1851 learned the business of pilot on the Mississippi. Thence he went to the Nevada mines; became in 1862 local editor of a newspaper in Virginia City; went to San Francisco; was for some time a reporter, and worked in the Calaveras gold diggings. In 1866 he went to the Sandwich Islands, and on his return commenced his lecturing career. He edited for a time a paper in Buffalo, and finally married and settled in Hartford, Conn. His chief books are *The Jumping Frog, etc.; Roughing It; The Innocents Abroad; Tom Sawyer; A Tramp Abroad; The Prince and the Pauper; Life on the Mississippi; Huckleberry Finn;* and *Life of Joan of Arc;* etc.

Clem'ent, the name assumed by many popes, the first being Clement of Rome. CLEMENT XIV who abolished the order of Jesuits, was one of the most distinguished. He d. in 1774.

Clemen'ti, MUZIO (1752–1832), pianist and composer. He was engaged as director of the orchestra of the opera in London, and his fame having rapidly increased he went in 1780 to Paris, and in 1781 to Vienna, where he played with Mozart before the emperor. In 1784 he repeated his visit to Paris, but after that remained in England till 1802, when he went back to the Continent. He returned in 1810 to England, where he settled down as superintendent of one of the principal musical establishments in London. He was interred in Westminster Abbey.

Cleobu'lus, one of the *seven wise men* of ancient Greece, a native of Lindus, who traveled to Egypt to learn wisdom, and became king of Rhodes. He flourished B.C. 560.

Cleom'enes (-nēz), the name of three kings of Sparta, the most distinguished of whom is Cleomenes III, the last of the Heraclidæ, king from 236 to 220 B. C. He intended to reform Sparta, and to restore the institutions of Lycurgus, and therefore put to death the ephori, made a new division of lands, introduced again the old Spartan system of education, made his brother his colleague, and extended the franchise.

Cle'on, an Athenian demagogue. He distinguished himself by the proposal to put to death the adult males of the revolted Mytileneans and sell the women and children as slaves. In 425 he took Sphacteria from the Spartans; but in 423 and 422 he was violently attacked by Aristophanes in *The Knights* and in *The Wasps.* He was sent, however, in 422 against Brasidas, but allowed himself to be taken unawares, and was slain while attempting to flee.

Cleopat'ra (B. C. 69–30), a Greek queen of Egypt, daughter of Ptolemy Aulētēs. When she was seventeen her father died, leaving her as joint heir to the throne with his eldest son Ptolemy, whom she was to marry—such marriages being common among the Ptolemies. Being deprived of her part in the government (B. C. 49), she won Cæsar to her cause, and was reinstated by his influence. In a second dis-

turbance Ptolemy lost his life, and Cæsar proclaimed Cleopatra queen of Egypt, though she was compelled to take her brother, the younger Ptolemy, as husband and colleague. Cæsar continued some time at Cleopatra's court, and had a son by her named Cæsarion. By poisoning her brother she remained sole possessor of the regal power, took the part of the triumvirs in the civil war at Rome, and after the battle of Philippi sailed to join Antony at Tarsus. Their meeting was celebrated by splendid festivals; she accompanied him to Tyre, and was followed by him on her return to Egypt. After his conquest of Armenia he again returned to her, and made his three sons by her, and also Cæsarion, kings. On the commencement of the war between Augustus and Antony, the latter lost a whole year in festivals and amusements with Cleopatra at Ephesus, Samos, and Athens, and when at last the fleets met at Actium, Cleopatra suddenly took to flight, with all her ships, and Antony immediately followed her. They fled to Egypt, and declared to Augustus that if Egypt were left to Cleopatra's children they would thenceforth live in retirement. Augustus, however, demanded Antony's death, and advanced on Alexandria. Believing Cleopatra, who had taken refuge in her mausoleum, to be treacherous and dead, Antony threw himself on his sword, and shortly afterward Cleopatra killed herself by applying an asp to her arm to escape the ignominy of being led in a Roman triumph. With her the dynasty of the Ptolemies ended.

Cleopatra's Needles, the name given to two Egyptian obelisks, formerly at Alexandria, but one of which is now in New York, the other in London. They are made of the rose-red granite of Syene, and were originally erected by the Egyptian king Thothmes III in front of the great temple of Heliopolis, the On of the Scriptures, where Moses was b. They were taken to Alexandria shortly before the commencement of the Christian era, and after the death of Cleopatra, but possibly in pursuance of a design originated by her. The New York obelisk was presented to America by the Khedive of Egypt, and was set up in Central Park in 1881.

Clep'sydra (or Waterclock), an ancient instrument for the measurement of time by the escape of water from a vessel through an orifice. In the older ones the hours were estimated simply by the sinking of the surface of the water, in others the water surface is connected with a dial plate and hand by a system of weights and floats.

Clergy, the body of ecclesiastical persons, in contradistinction to the *laity*. The Greek word came into use to indicate that this class was to be considered as the particular inheritance and property of God, or else, which is more probable, because it was customary to select by lot those set apart for special religious functions. At first there was no strongly marked distinction between clergy and laity, but the former soon drew apart, consisting, after the apostolic age, of bishops, priests, and deacons, and in the fourth century of many

additional inferior orders, such as sub-deacons, acolytes, etc. With the increased complexity of the hierarchy there was a steady accretion of privileges until the burden of these became intolerable to the laity. Few of these now remain, the clergy being generally regarded as invested with no inherent claim to regard. A clergyman cannot, however, be compelled to serve as juryman; he is exempted from arrest while celebrating divine worship, from acting as bailiff, constable, or like office. The Episcopalians recognize three classes of clergy—bishops, priests, and deacons; and generally hold the doctrine of the apostolic succession. Large numbers of Protestants, however, reject this dogma, and believe in the ministry of only one order.

Clermont-Ferrand, a town of France, capital of department Puyde-Dôme. It is an antique and gloomy town built of dark volcanic stone. The most remarkable edifices are the cathedral, a huge, irregular, gloomy pile, and the church of Notre Dame, founded in 580. The manufactures are more numerous than extensive; but the position of the town makes it an important center of trade. Pop. 50,119.

Cleveland, Cuyahoga co, O., first city in the state, situated on the south shore of Lake Erie, at the mouth of the Cuyahoga River. There are seven railroads centering at Cleveland: L. S. & M. S.; C. & P.; C. C. C. & I.; N. Y. C. & St. L.; N. Y. L. E. & W.; C. & C.; and the Valley. The most important articles of trade are coal, coke, iron, petroleum, lumber, flour and grain, and wool. The principal manufactures are those under the head of iron industries, also ship and lumber yards, flouring mills, iron foundries and factories, oil and chemical works, brick yards, rolling mills, etc. The city contains several very fine parks and numerous educational institutions. Among the latter are Adelbert College, Case School of Applied Science, and St. Mary's Theological Seminary. The city was first settled in 1796. Pop. 1900, 381,768.

Cleveland, Grover, an American statesman, twice president of the U. S., b. in Caldwell, Essex co., N. J., March 18, 1837. His father, Richard F., was a Presbyterian clergyman. After the death of his father Grover became a clerk and assistant teacher in the N. Y. institution for the blind, and in 1855 he went West. He was admitted to the bar in 1859 in Buffalo. In 1863–1866 he was district attorney of Erie county. He was made sheriff of Erie county in 1870. In 1881 he was elected mayor of Buffalo. In 1882 he was elected governor of New York. He was nominated for president of the U. S. at the National Democratic Convention held in Chicago in 1884, and was inaugurated March 4, 1885, serving until 1889. During the latter part of Cleveland's term the head of the department of agriculture was made a cabinet officer. On March 13, 1885, he issued a proclamation to remove the white intruders from Oklahoma, Indian Territory, and after the burning of Aspinwall, Panama, by the revolutionists, March 31, 1885, ordered a naval expedition to protect the Americans and their

property. In 1888 he was Democratic candidate for president, but he was defeated by the Republican candidate, Benjamin Harrison. He then removed to New York, and practised law. On June 2, 1886, he married Miss Frances Folsom, the daughter of Oscar Folsom. The wedding took place in the White House. He was again elected president in 1892 to serve until 1897 and as such opened the World's Columbian Exposition. His second administration was memorable for the stand he took on the financial question, and railroad strikes, and for the Venezuela message.

Clevenger, SHOBAL VAIL (1812–1843), American sculptor. His father was a weaver, who went to Cincinnati with his son, and apprenticed him to a stonecutter. He at once manifested artistic ability in carving tombstone work, and learned to hew busts in freestone. Subsequently he chose the career of a sculptor, and as such settled in New York City. Many of his works are contained in the art galleries of New York, Boston, and Philadelphia. In 1840 he went to Rome, where he produced his *North American Indian.* He d. on the Mediterranean, within a day's sail of Gibraltar.

Cleves (klēvz), formerly the capital of the dukedom of Cleves, a town in Rhenish Prussia, 70 mi. n.w. of Cologne, about a league from the Rhine, with which it is connected by a canal. It has manufactures of tobacco, leather, and cottons, and a mineral spring with baths, etc. Pop. 10,170.

Cli'ents, in ancient Rome, were citizens of the lower ranks who chose a patron from the higher classes, whose duty it was to advise and assist them, particularly in legal cases, and in general to protect them. The clients, on the other hand, were obliged to portion the daughters of the patron if he had not sufficient fortune; to follow him to the wars; to vote for him if he was candidate for an office, etc. This relation continued till the time of the emperors.

Cliff Dwellers, an aboriginal American race of people who built their houses in the cliffs and rocks. Their cave dwellings were often artificial caverns closed and strengthened by stone walls, while their cliff houses were veritable fortresses, to which the inhabitants retreated when menaced by any serious danger. Everywhere on the cliffs, in the inequalities of the rocks, in grottoes and promontories, the Cliff Dwellers succeeded in building their houses. Any situation pleased them provided it gave hope of a little security. These dwellings have even been found hollowed in layers of volcanic ashes hardened by time, while all around pieces of cut silex and fragments of pottery attest the long sojourn of man. One "Cliff Palace" has a length of 421 ft., contains 127 rooms, and 23 estufas, and is capable of affording shelter to 1,500 persons. The dwellings are constructed either of sorted stones held together with moistened clay, or of adobe or sun-dried bricks. The circular ruins contain a number of small cells, and a building, often half subterranean in the center, which

the Spaniards have called an "estufa." Some contend that these estufas were the council chambers where the principal men of the tribe assembled, while others hold that they were meant to keep the sacred fire, which is even to-day an object of veneration with the Indians. The cliff houses take the shape of the platform on which they stand, and the walls are soldered to the sides of the rock. The walls are built with stones cemented by a mixture of charcoal and ashes, further consolidated by the insertion of small pebbles and bits of pottery. Even to-day the marks of the tools and the workmen's fingers can be seen on the masonry. Sometimes the homes of the Cliff Dwellers were at a great altitude, being as high as 800 ft. above the level of the river. Late researches have revealed the existence of springs which had been tapped and brought into natural and skillfully made reservoirs. The entire San Juan valley is strewn with ruins. There is one long, narrow structure running in front of a cave 200 ft. wide at the mouth, where windows 18 in. sq. are the only means of entrance, there being no door. Several human hands painted in ochre are to be seen on the walls. A small number of cemeteries have been found dating from the epoch of the Cliff people. Recent explorations have brought to light a small number of mummies in a fair state of preservation. Side by side with the bodies, weapons, utensils, and ornaments were found. Like the Mound Builders and all ancient peoples of America, the Cliff Dwellers died in the hope of a future life. Everything points to a civilization superior, and probably posterior, to that of the Mound Builders. There is abundant proof that the family and the owning of private property was established here, as evidenced by the existence of isolated dwellings.

Arizona presents interesting objects of study. The mountains rise to a height of 6,500 ft. above the level of the valley. Everywhere the rock has been pierced, and everywhere had man established his home. The access to them is very difficult. A narrow, dangerous path leads down from the top of the cliff, but is barred by a house built of quarried and well-cemented stone, of better and probably later construction than the other dwellings. Proofs of man's existence have also been found in the lava of volcanoes, extinct in the quaternary period. Agriculture seems to have been more perfect among the inhabitants of Arizona than among the ancient New Mexicans. They cultivated maize, beans, watermelons, cotton, and tobacco. Among their domestic animals we may mention the turkey, and probably the rabbit and species of llama. Neither here nor anywhere else in these regions have the excavations resulted in the discovery of any metal objects, with the exception of a few small amulets made of copper. On the other hand a great variety of pottery has been found, always tastefully decorated. Numerous weapons of polished stone, bone implements, and sea shells have also been discovered. The designs on the Arizona pottery resemble the ornaments in the temple of Mitla, and these again recall

the ancient peoples of Italy. Some of the pottery is shaped after the human form, but more frequently after the forms of animals and birds. The duck seems to have been the favorite model with the Mound Builders, and the owl is common with the Cliff Dwellers. Lightness was evidently a quality sought after, and the potter succeeded in reducing the thickness of even the largest vases to a few millimeters. Several pieces had been covered with varnish which on drying gave a brilliant enamel. Arrow heads are found in great numbers, another proof of the struggle for existence carried on by people who had to be ever on the alert to defend themselves against their unknown enemies. A number of irrigation canals bear witness to the industry of the inhabitants. The existence of these canals, wherever they could be of assistance for commerce or agriculture, conveys an idea of the progress realized by these people.

The difficulties attending excavations have necessarily influenced the number of human bones discovered. The works carried out at one place in Arizona produced some 300 skeletons, about 50 of which are complete. The stature is small. The bodies had been laid, dressed in their clothes, and bent double, in a chamber measuring 22 ft. in diameter.

In prehistoric times, distinct races occupied Central America. These races may originally have belonged to one source, but their separation dates from a considerable number of centuries and nothing in the facts we know permits an assertion or denial of the hypothesis. Many centuries, probably, before the coming of the Spaniards, the decadence of these peoples had begun. The causes of decadence are manifold. Among the most serious we must reckon the invasion of the Apaches. The Cliff Dwellers made a long but impotent resistance. They had to abandon their homes and wander farther south where their struggles were continued a long time with diminishing success. The destruction of the forests, a prolonged drought, the disappearance of the watercourses, changed the lands into arid deserts and sandy valleys, and the Dwellers had to leave the land where the struggle against nature became impossible.

Clifford, NATHAN (1803–1881), American statesman. He became a lawyer in Maine, and was elected to the state legislature in 1830. In 1834 he became attorney general of the state, and in 1838 was elected to Congress where he served two terms. In 1846 he became attorney general of the U. S., and in 1848–49 was special envoy to Mexico. In 1858 he was nominated associate justice of the U. S. Supreme Court, which office he held until his death. He presided over the Hayes–Tilden electoral commission of 1877.

Clifford, WILLIAM KINGDON (1845–1879), English mathematician. In 1871 he was appointed professor of applied mathematics at University College, London. In mathematics his teaching and writings mark an epoch in the history of the science in England. He also wrote on philosophical subjects.

Climate, the character of the weather or atmospheric phenomena peculiar to every country as respects heat and cold, humidity and dryness, the direction and force of the prevailing winds, the alternation of the seasons, etc., especially as such conditions affect animal and vegetable life. In general, geographical latitude is the principal circumstance to be taken into view in considering the climate of a country, and thus the torrid, temperate, and frigid zones may each be said roughly to have a climate of its own. The highest degree of heat is found in the equatorial regions, and the lowest, or the greatest degree of cold, at the poles. In the former the temperature continues practically the same all the year round, though there may be alternating rainy seasons and dry seasons. The variations in temperature are very considerable in the temperate zones, and increase as we approach the polar circles. The heat of the higher latitudes is, in July, greater than that of countries nearer the equator, and at Tornea, in Lapland, where the sun's rays are very oblique even in summer, the heat is sometimes equal to that of the torrid zone, because the sun is almost always above the horizon. But even in the equatorial regions, and still more in intermediate regions, the temperature is affected by local configuration and circumstances. In the deserts of Africa, for instance, owing to the exceptional radiating power of sandy plains and the absence of aqueous vapor in the atmosphere, the heat is excessive, while in the corresponding latitudes of South America the mountainous character of the country makes the climate more moderate. Altitude above the sea indeed has everywhere the same effect as removal to a greater distance from the equator, and thus in the Andes we may have a tropical climate at the sea-level and an arctic one on the mountain summits. The winds to which a country is most exposed by its situation have also a great influence on the climate. In the northern hemisphere if north and east winds blow frequently in any region it will be colder, the latitude being the same, than another which is often swept by milder breezes from the south and west. The climate of Southern Europe, for instance, is decidedly affected by the warm south winds which blow from the hot deserts of Africa. The greater or lesser extent of coast line a country possesses in proportion to its area has a decided influence on the climate. The almost unvarying temperature of the ocean equalizes in some degree the periodic distribution of heat among the different seasons of the year, and the proximity of a great mass of water moderates, by its action on the atmosphere, the heat of summer and the cold of winter. Hence the more equable temperature of islands and coasts as compared with that of places far inland. The British Isles, Tasmania, and New Zealand enjoy a mild or insular climate as compared with, say, Central Russia or Central Asia. Thus it happens that London has a milder winter and a cooler summer than Paris, though the latter is nearly 3° farther south. Similarly, though Warsaw and

Amsterdam are almost in the same latitude, the mean annual temperature of the former is 46.48°, while it reaches at the latter 53.4° F. The proximity of large masses of water involves also the presence of much aqueous vapor in the atmosphere, which may be condensed in abundant rains so as to greatly influence the plant life of a country. Direction of mountain chains, set of ocean currents, nature of soil, are other modifying elements. In exhibiting graphically the chief climatic facts of a region various methods may be adopted, but in all the use of *isothermal lines* is one of the most instructive features. These are lines drawn on a map or chart connecting those places which have the same mean annual temperature or same mean summer and mean winter temperature. In this way we may divide the earth into zones of temperature which by no means coincide with the limits of the zones into which the earth is astronomically divided, and when compared with these on a map show interesting and instructive divergences. Geology teaches that vast changes have taken place in the climate of most if not of all countries, the causes of which are not fully understood.

Climbing Perch, a singular fish, remarkable for having the pharyngeal bones enlarged and modified into a series of cells and duplications so that they can retain sufficient water to keep the gills moist and enable the fish to live out of water for six days. The climbing perch of India proceeds long distances overland in search of water when the pools in which it has been living have dried up. It is also credited with a power of climbing the rough stems of palm trees, but as to this latter point authorities disagree.

Climbing Perch.

Climbing Plants are plants of weak stems which naturally seek support from their surroundings to rise from the ground. Some are twining plants, rising by winding themselves or their tendrils round the trunks of trees, etc. Such are the honeysuckle and scarlet runner. Others, like the ivy, attach themselves by small roots developed from the stem as they ascend. Some in climbing always twine spirally from right to left, others again always take the opposite direction.

Clinton, DeWitt (1769–1828), a famous American statesman and lawyer. He was educated at Columbia College, and in 1788 was admitted to the bar. In 1797 he was elected member of the Assembly, in 1798 member of the senate of the state of New York, and in 1801 member of the Senate of the U. S. For twelve years, with two short breaks, which

amounted to three years, he occupied the position of mayor of New York. He was again member of the senate of New York from 1803 to 1811, and lieutenant governor of the state from 1811 to 1813. In 1812 he was defeated by Madison for president. In 1816 he was once more chosen governor of the state; in 1819 he was re-elected, and again in 1824 and 1826.

Clinton, George (1739–1812), American statesman. In 1768 he was elected to the New York assembly, and in 1775 was a delegate to the Continental Congress. In 1777 he was a deputy to the Provincial Congress which framed the state constitution. He was appointed a brigadier general in the Continental army in 1777. He was first governor of the state, serving from 1777 till 1795. In 1780 he thwarted an expedition led by Sir John Johnson, Brant, and Cornplanter, into the Mohawk Valley, and was instrumental in concluding treaties of peace with the Western Indians. In 1783 he accompanied Washington and Hamilton on a tour of the northern and western posts of the state. He helped to suppress Shay's rebellion in 1787. In 1791 he advocated the improvement of internal communication by navigation companies. In 1800 he served in the legislature, and in 1801 was again governor. In 1804 he was elected vice president of the U. S., which office he held until his death.

Clinton, Sir Henry (1738–1795), British general. He arrived in Boston as major general, 1775. He was second in command in the movements that compelled the Americans to evacuate New York in September, 1775, and was left in command of that city in the summer of 1777. On October 6, he stormed forts Clinton and Montgomery, and was appointed commander in chief of His Majesty's forces in America, with the rank of lieutenant general. In June, 1778, he evacuated Philadelphia, and on his retreat through New Jersey fought with Washington at Monmouth Court House. He went to South Carolina in December, 1779, and captured Charleston May 12, 1780. In October, 1781, he set sail for Chesapeake Bay, with a large force, to aid Lord Cornwallis, but, at the entrance of the Chesapeake, he learned that Cornwallis had surrendered; upon hearing which he returned to New York. In June, 1782, he returned to England. He was elected to Parliament, and was afterward make governor of Limerick. In 1793 he was placed in command of Gibraltar, where he died.

Clinton, James (1736–1812), American soldier, was the son of Charles Clinton. He was appointed an ensign in the second regiment of the Ulster county militia, in which he became a lieutenant colonel. During the Anglo-French War he distinguished himself at Fort Frontenac, and served in General Montgomery's expedition to Canada. He was made brigadier general in the Continental army in 1776, commanded Fort Clinton when it was attacked by Sir Henry Clinton, Oct. 6, 1777, and was the last man to leave the works. Although suffering from a severe bayonet wound he escaped by sliding down a precipice of 100

ft. to the creek. He took part in General Sullivan's expedition against the Iroquois of Western New Nork in 1779. Afterward he commanded the northern department, stationed at Albany.

Clinton, Worcester co., Mass., 45 mi. w. of Boston. Railroad, Boston & Fitchburg. The Nashua River supplies water power to a number of establishments, the principal products being ginghams and plaids, Brussels carpets, and cotton goods. Wirecloth, hollow ware, boots and shoes, and machinery are also manufactured. Pop. 1900, 13,667.

Clinton, Clinton co., Ia., on Mississippi River, 138 mi. w. of Chicago. Railroads: C. & N. W.; C. B. & Q.; C. M. & St. P.; B. C. R. & N. Industries: sawmills, two flouring mills, several iron foundries, chair, furniture, cracker, mattress, and wagon factories. The town was first settled in 1856. Population 1900, 22,698.

Clinton, Henry co., Mo., 85 mi. s.e. of Kansas City. Railroads: M. K. &. T.; K. C. Ft. S. & M., and K. C. O. & S. Industries: railroad shops, three flouring mills, two iron foundries, potteries, and a large ice plant. Clinton is an important center for the raising and shipping of poultry. Surrounding country agricultural and mineral, coal fields partly developed; four flowing artesian wells. The village was located in 1836; became a city in 1878. Pop. 1900, 5,061.

Cli'o, in Greek mythology, daughter of Zeus and Mnemosyne; the muse of history. Her attributes are a wreath of laurel upon her head, a trumpet in her right hand, and a roll of papyrus in her left.

Clith'ereo, a town of England, Lancaster co., 28 mi. n.n.w. of Manchester. It is the seat of some large cotton spinning and weaving establishments, paper factories, foundries, and large print works. Pop. 10,815.

Cli'tus, the foster brother of Alexander the Great. He saved Alexander's life at the Granīcus, but was afterward slain by him in a fit of intoxication, an act for which Alexander always showed the bitterest remorse.

Clive, Robert (1725–1774), English general and statesman, was b. in Shropshire. In 1751 Clive, who had already a reputation for skill and courage, marched on the large city of Arcot with 200 British troops and 300 Sepoys, and took it. In 1753 he sailed to England to recover his health. Two years later he was back in India, in governorship of St. David's from which he was soon summoned to command the expedition sent to Bengal. Clive was made governor of Calcutta. Here he was equally successful against the encroachments of the Dutch. He now visited England again. In 1761 he was raised to the Irish peerage with the title of Lord Clive, Baron of Plassey. After a time his health became poor, and in one of his habitual fits of melancholy he put an end to his life.

Cloca'ca, an underground conduit for drainage, of which the oldest known example is the great sewer at Rome, built some 2,500 years ago. A portion of it is still standing. It is about 13 ft. high and as many wide. The term is also applied to the excrementory cavity in birds, reptiles, many fishes, and lower mammalia, formed by the extremity of the intestinal canal.

Clock, an instrument for measuring time and indicating hours, minutes, and usually seconds, by means of hands moving on a dial-plate, and differing from a watch mainly in having the movement of its machinery regulated by a pendulum, and in not being portable. The largest and most typical clocks also differ in having their machinery set in motion by means of a falling weight or weights, the watch wheel-work being moved by the force of an uncoiling spring; but many clocks also have a spring setting their works in motion. The use of an hour-teller was common even among the ancients, but their time-pieces were nothing else than sun-dials, hour-glasses, and clepsydræ. In the earlier half of our era we have accounts of several attempts at clock construction; that of Boethius in the sixth century, the clock sent by Harun al Rashid to Charlemagne in 809, that made by Pacificus, archdeacon of Verona, in the ninth century, and that of Pope Sylvester II in the tenth century. It is doubtful, however, if any of these was a wheel-and-weight clock, and it is probably to the monks that we owe the invention of clocks set in motion by wheels and weights. In the twelfth century clocks were made use of in the monasteries, which announced the end of every hour by the sound of a bell put in motion by means of wheels. From this time forward the expression "the clock has struck," is often met with. The hand for marking the time is also made mention of. In the fourteenth century there are stronger traces of the present system of clock-work. Dante particularly mentions clocks. Richard, abbot of St. Albans in England, made a clock in 1326, such as had never been heard of till then. It not only indicated the course of the sun and moon, but also the ebb and flood tide. Large clocks on steeples likewise were first made use of in the fourteenth century. Watches are a much later invention, although they have likewise been said to have been invented as early as the fourteenth century. A celebrated clock, the construction of which is well known, was set up in Paris for Charles V in 1379, the maker being Henry de Vick, a German. It probably formed a model on which clocks were constructed for nearly 300 years, and until Huyghens applied the pendulum to clock-work as the regulating power, about 1657. The great advantage of the pendulum is that the beats or oscillations of a pendulum all occupy substantially the same time (the time depending on its length), hence its utility in imparting regularity to a time-measurer. The mechanism by which comparative regularity was previously attained, though ingenious and simple, was far less perfect; and the first pendulum *escapement*, that is, the contrivance by which the pendulum was connected with the clock-work, was also less perfect than others subsequently intro-

duced, especially Graham's *dead-beat* escapement invented in 1700. In a watch the balance-wheel and spring serve the same purpose as the pendulum, and the honor of being the inventor of the balance-spring was contested between Huyghens and the English philosopher, Dr. Hooke. Various improvements followed, such as the chronometer escapement, and the addition of a compensation adjustment, by which two metals having unequal rates of expansion and contraction under variations of temperature are combined in the pendulum or the balance-wheel, so that, each metal counteracting the other, the vibrations are isochronous under any change of temperature. This arrangement was perfected by Harrison in 1726, and is especially useful in navigation. The striking machinery of a clock, or that by which hours, quarters, etc., are sounded, is no necessary part of a clock, and forms indeed a separate portion of the works, usually driven by a separate falling weight, and coming into play at certain times, when there is a temporary connection between the two portions of the clock machinery. American methods of clock-making by machinery have revolutionized the clock trade and produced a world-wide market for the products of the Waterbury Clock Company and similar firms. In Liberia there is neither clock nor timepiece of any sort, the reckoning of time being guided entirely by the sun's movement and position.

Clo′dius Pulcher, PUBLIUS, a notorious public character of ancient Rome, son of Appius Claudius Pulcher. He served in the third Mithridatic war and filled different high posts in the provinces of the East. Returning to Rome, he became a popular demagogue, was elected tribune in 59 B. C., was the means of procuring Cicero's banishment, and continued to be a ringleader in all the seditions of the time till killed.

Clois′ter, an arched way or gallery, often forming part of certain portions of monastic and collegiate buildings, usually having a wall of the building on one side, and an open colonnade, or a series of windows with piers and columns adjoining an interior yard or court on the other side. Such galleries were originally intended as places of exercise and recreation, the persons using them being under cover. The term is also used as equivalent to convent or monastery.

Clothes Moth, the name common to several moths whose larvæ are destructive to woolen fabrics, feathers, furs, etc., upon which they feed, using at the same time the material for the construction of the cases in which they assume the chrysalis state.

Clo′tho, in Greek mythology, that one of the three Fates or Parcæ whose duty it was to put the wool for the thread of life round the spindle, while that of Lachasis was to spin it, and that of Atropos to cut it when the time had come.

Cloud, a collection of visible vapor or watery particles suspended in the atmosphere at some altitude. They differ from fogs only by their

height and less degree of transparency. The average height of clouds is calculated to be 2½ mi., thin and light clouds being much higher than the highest mountains, while thick, heavy clouds often touch low mountains, steeples, and even trees. Clouds differ much in form and character, but are generally classed into three simple or primary forms, viz.: 1, The *cirrus*, so called from its resemblance to a lock

Cirrus.

of hair, and consisting of fibers which diverge in all directions. Clouds of this description float at a general height, usually from 3 to 5 mi. above the earth's surface. 2, The *cumulus* or *heap*, a cloud which assumes the form of dense convex or conical heaps, resting on a flattish base, called also summer cloud. Under ordinary circumstances these clouds accompany fine weather, especially in the heat of summer. They attain their greatest size early

Cumulus.

in the afternoon and gradually decrease toward sunset. 3, The *stratus*, so named from its spreading out uniformly in a horizontal layer, which receives all its augmentations of volume from below. It belongs essentially to the night, and is frequently seen on calm summer evenings after sunset ascending from the lower to the higher grounds, and dispersing in the form of a cumulus at sunrise. These three primary forms of clouds are subdivided as follows: 1, The *cirro cumulus*, composed of a collection of cirri, and spreading itself fre-

quently over the sky in the form of beds of delicate snowflakes. 2, The *cirro stratus* or *wane cloud*, so called from its being generally seen slowly sinking, and in a state of transformation. When seen in the distance a collection of these clouds suggests the resemblance of a shoal of fish, and the sky, when thickly mottled with them, is called in popular language a *mackerel sky*. 2, The *cumulŏ stratus* or *twain cloud*, one of the grandest and most beautiful of clouds, and consisting of a collection of large, fleecy clouds overhanging a flat

Stratus.

stratum or base. 4, The *nimbus*, *cumulo-cirro-stratus*, or *rain cloud*, recognizable, according to Mr. Howard, by its fibrous border and uniformly gray aspect. It is a dense cloud spreading out into a crown of cirrus and passing beneath into a shower. It presents one of the least attractive appearances among clouds, but it is only when the dark surface of this cloud forms its background that the splendid phenomenon of the rainbow is exhibited in perfection.

Cloud (klö), St., a town, France, department Seine-et-Oise, 6 mi. s.w. from Paris. It is celebrated for its château and its magnificent park. As the residence of the monarchs of France, St. Cloud is historically interesting. Louis XIV bought the old château and presented it to his brother, who enlarged and transformed it into a splendid palace, which became the residence of Henrietta, queen of Charles I of England, during her exile. It was chosen by Napoleon for his residence, was the summer residence of Napoleon III, and was greatly damaged in the Franco-German War. Pop. 5,163.

Cloudberry (or Mountain Bramble), a fruit found plentifully in the north of Asia, America, and Europe, and common in some of the more elevated moors of Britain. The plant is from 4 to 8 or 10 in. high, with a rather large handsome leaf, indented and serrated at the edges. The flowers are large and white, and the berries, which have a very fine flavor, are orange yellow in color, and about the size of a bramble berry.

Clove Bark (or Culil'awan Bark), is fur-

nished by a tree of the Molucca Islands. It is in pieces more or less long, almost flat, thick, fibrous, covered with a white epidermis of a reddish yellow inside, of a nutmeg and clover odor, and of an aromatic and sharp taste.

Clover (or Trefoil), a name of different species of plants. There are about 150 species. Some are weeds, but many species are valued as food for cattle. Common red clover, is a biennial, and sometimes, especially on chalky soils, a triennial plant. This is the kind most commonly cultivated, as it yields a larger product than any of the other sorts. White clover is a most valuable plant for pasturage over the whole of Europe, Central Asia, and North America, and has also been introduced into South America. The bee gathers much

A.—White Clover.
B.—Red Clover.

of its honey from the flowers of this species. Alsike, hybrid, or Swedish clover, has been long cultivated in the south of Sweden, and for some time also in other countries; it is strongly recommended for cold, moist, stiff soils. It resembles the common red clover in duration, stature, and mode of growth. Perennial red or meadow clover much resembles the common red, but differs somewhat in habit, and the bright red flowers are larger and form a less compact head. Its produce is less in quantity, and not so nutritive, as that of the common red.

Clover Weevil, a kind of weevil, different species of which feed on the leaves and seeds of the clover, as also on tares and other leguminous plants.

Cloves, a very pungent aromatic spice, the dried flower buds, a native of the Molucca Islands, belonging to the myrtle tribe, now cultivated in Sumatra, Mauritius, Malacca, Jamaica, etc. The tree is a handsome evergreen from 15 to 30 ft. high, with large, elliptic, smooth leaves and numerous purplish

flowers on jointed stalks. Every part of the plant abounds in the volatile oil for which the flower buds are prized. The spice yields a very fragrant odor, and has a bitterish, pungent, and warm taste. It is sometimes em-

Clove.
a.—branch with leaves, buds, and flowers; *b.*—bud.

ployed as a hot and stimulating medicine, but is more frequently used in culinary preparations.

Clovis (465–511), king of the Franks, succeeded his father Childeric in the year 481, as chief of the warlike tribe of Salian Franks, who inhabited Northern Gaul. In 486 he overthrew the Roman governor at Soissons and occupied the country between the Somme and the Loire. He d. at Paris, which he had made his capital.

Club, a select number of persons in the habit of meeting for the promotion of some common object, as social intercourse, literature, politics, etc. The coffee houses of the seventeenth and eighteenth centuries are the best representatives of what is meant by a modern club, while the clubs of that time were commonly nothing but a kind of restaurants or taverns where people resorted to take their meals. Among the earliest of the London clubs was the *Kit-cat Club*, among whose forty members were dukes, earls, and the leading authors of the day. Another club formed about the same time was the *Beefsteak Club.* Originally these two clubs had no pronounced political views, but in the end they began to occupy themselves with politics. Perhaps the most celebrated club of last century was that which was first called The Club *par excellence*, and numbered among its members Dr. Johnson, Sir Joshua Reynolds, Edmund Burke, Oliver Goldsmith, Edward Gibbon, and others. The most important London political clubs

of the present day are the Carlton Club, a sort of headquarters for the Conservative party, and the Reform Club, the building belonging to which stands next to that of the Carlton Club, the great club of the Liberal party. Clubs and club-life have reached their highest plane in our own country. Every important city numbers in its more important buildings the palatial quarters of some prominent club. New York, Chicago, Boston, Philadelphia, and San Francisco vie with each other in the sumptuous surroundings of their clubs. The Union League, Manhattan and Metropolitan clubs of New York, the Union League and Chicago clubs of Chicago, and a score of others rival in their luxurious appointments the most famous clubs of the Old World.

Cluny (klụ-nē), a town of Eastern France, 11 mi. n.w. Macon, pop. 4,007. Here was a Benedictine abbey founded in 910, at one time the most celebrated in France, having 2,000 monastic communities directly under its sway in France, Italy, Spain, England, etc., the inmates of which formed the congregation of Cluniac monks. Most of it was destroyed in 1789, and the present town is to some extent built of its debris and occupies its site.

Cluseret, Gustave Paul (1823–1896), French soldier. In 1848, he became chief of a battalion of national guards and chevalier of the Legion of Honor. He served in Algeria and the Crimea, and in 1860 joined Garibaldi. In January, 1862, he entered the service of the U. S. In 1864 he edited a paper in New York City. He was for a short time minister of war under the Commune. He was arrested, but managed to escape both from the Communists and the police of the republic.

Clyde, Colin Campbell, Lord (1792–1863), a famous British soldier, was b. in Glasgow. By the assistance of his mother's relations he was educated at the high school of Glasgow, and afterward at the military academy, Gosport. In 1808 he received an ensign's commission in the Ninth Regiment of Foot. He served in Spain under Sir John Moore and Wellington. In 1819–25 he was in the West Indies. In 1835 he attained the rank of lieutenant colonel. In 1842 he was in China, and on the termination of the Chinese War took active service in India. In 1854 he became major general with the command of the Highland Brigade in the Crimean War. On the outbreak of the Indian mutiny he was appointed to the chief command there. Landing at Calcutta on Aug. 29, 1857, he relieved Havelock and Outram at Lucknow, and crushed the rebellion entirely before the end of the year. He was created a peer with the title of Baron Clyde, and had an income of $10,000 a year allotted him. In 1862 he was made field marshal. He was buried in Westminster Abbey.

Clytemnestra, in Greek mythology, daughter of King Tyndareus and Leda, and half sister of Helen. During the absence of Agamemnon in the war against Troy she bestowed her favors on Ægisthus, and, in connection with him, murdered Agamemnon on his return

from Troy, and, together with her paramour, governed Mycenæ for seven years.

Coach, a general name for all covered carriages drawn by horses and intended for the rapid conveyance of passengers. The earliest carriages appear to have been all open. At Rome both covered and uncovered carriages were in use. After the fall of the Roman Empire they went out of use again, and during the feudal ages the custom was to ride on horseback, the use of carriages being considered effeminate. They do not appear to have become common till the fifteenth century, and even then were regarded exclusively as vehicles for women and invalids. Later on they became, especially in Germany, part of the appendages of royalty. They seem to have been introduced into England about the middle of the sixteenth century, but were for long confined to the aristocracy and the wealthy classes. Hackney coaches were first used in London in 1625. They were then only twenty in number, and were kept at the hotels, where they had to be applied for when wanted. In 1634 coaches waiting to be hired at a particular stand were introduced. Stage coaches were introduced into England about the same time as hackney coaches. The first stage coach in London appears to have run early in the seventeenth century, and before the end of the century they were started on three of the principal roads in England. Their speed was at first very moderate, about 3 or 4 miles an hour. They could only run in the summer, and even then their progress was often greatly hindered by floods and by the wretched state of the roads generally. Mail coaches next followed. The manufacture of elegant carriages is a proof of much wealth and mechanical skill in a place, many different workmen being employed in their construction, and both the materials and the workmanship requiring to be of the best.

Coahuila (kō-ȧ-wē′lȧ), a state of Mexico, on the frontier of the U. S., rich in woods and pastures, and having several silver mines. Area 50,890 sq. mi.; pop. 130,026.

Coal, a solid, opaque, inflammable substance, mainly consisting of carbon, found in the earth, largely employed as fuel, and formed from vast masses of vegetable matter deposited through the luxuriant growth of plants in former epochs of the earth's history. In the varieties of coal in common use the combined effects of pressure, heat, and chemical action upon the substance have left few traces of its vegetable origin; but in the sandstones, clays, and shales accompanying the coal, the plants to which it principally owes its origin are presented in a fossil state in great profusion, and frequently with their structure so distinctly retained, although replaced by mineral substances, as to enable the microscopist to determine their botanical affinities with existing species. The sigillaria and stigmaria, the lepidodendron, the calamite, and tree ferns are among the commoner forms of vegetable life in the rocks of the coal formation. Trees of considerable magnitude have also been brought to light, having a recognizable relation to the modern araucaria. The animal remains found in the coal-measures indicate that some of the rocks have been deposited in fresh water, probably in lakes, while others are obviously of estuarine origin, or have been deposited at the mouths of rivers alternately occupied by fresh and salt water. The great system of strata in which coal is chiefly found is known as the Carboniferous. There are many varieties of coal, varying considerably in their composition, as *anthracite*, nearly pure carbon, and burning with little flame, much used for furnaces and malt kilns; *bituminous* (popularly so called) or "household coal"; and *cannel* or "gas coal," which burns readily like a candle, and is much used in gas making. All varieties agree in containing from 60 to over 90 per cent. of carbon, the other elements being chiefly oxygen and hydrogen, and frequently a small portion of nitrogen. *Lignite* or *brown coal* may contain only 50 per cent. carbon. For manufacturing purposes coals are generally considered to consist of two parts, the volatile or bituminous portion, which yields the gas used for lighting, and the substance, comparatively fixed, usually known as *coke*, which is obtained by heating the coals in ovens or other close arrangements. Coal was known to the ancients and to the Britons before the Roman invasion, and was used for fuel in England as early as 852 A.D. When coal was first used in the arts in London, it was objected to as injurious to health, and a proclamation was issued against its use, 1316. The first charter giving permission to dig coal was granted by Henry III, 1239. In 1281 the Newcastle coal trade became so important that laws were passed for its regulation. The steam engine applied to the collieries about 1715 introduced into England a new era in mining, and trade in coal increased extensively. The coal beds of Great Britain occupy an area of less than 12,000 sq. mi. Coal deposits of the U. S. exceed in area, variety, and excellence those of any other country in the world. Coal was first utilized in the U. S. in revolutionary times for the manufacture of arms. In 1789 coal was shipped from Richmond, Va., to Philadelphia, New York, and Boston. Coal was first used in a grate by Judge Jesse Fell, Wilkesbarre, Pa., 1808. The area of American coal fields is about 200,000 sq. mi., the most important of which is the Appalachian, covering about 60,000 sq. mi., extending through the states from Pennsylvania to Alabama. The anthracite district of Pennsylvania is the most important. Coal was first discovered in America by Father Hennepin, near what is now Ottawa, Ill. The first coal mined in the U. S. (1813) was sold at Philadelphia for $21 per ton. The first regular shipment of coal from the Pennsylvania mines was in 1820. The annual production from the Pennsylvania coal fields is valued at more than $59,000,000. Of bituminous coal Ohio and Illinois are most productive. Germany, France, and Belgium produce coal less extensively than the U. S. and Great Britain. The coal beds of Russia have been little

worked. Immense coal fields are known to exist in China, Japan, Australia, and Canada.

Coal Brass, the iron pyrites found in coal measures, so named on account of its brassy appearance. Coal containing much pyrites is bad for iron smelting, and it is unpleasant for domestic use on account of the sulphurous acid which it gives off on burning. Coal brass is useful in the manufacture of copperas and in alkali works.

Coal Cutting Machine, any machine for cutting out coal in the pit, the chief objects they are intended to serve being the cheapening of the work, the saving of a large quantity of coal, which in the ordinary process of holing by hand labor with the pick is broken up into slack and dust, and the removal of the danger attending upon the employment of hand labor. The instruments of excavation in these machines are constructed on various principles, some having an action like that of an ordinary pick, others a horizontal cutting tool. There are usually arrangements for regulating the depth and force, and to a certain extent the direction, of the blow, and the precision obtained is fully equal to that of hand labor.

Coal Fish, a species of the cod genus, named from the color of its back. It grows to the length of 2½ ft., and is found in great numbers about the Orkneys and the northern parts of Britain.

Coal Gas, the variety of carbureted hydrogen which produces common gaslight.

Coal Tar (or Gas Tar), a substance obtained in the distillation of coal for the manufacture of illuminating gas, a dark-colored more or less viscid mass, consisting principally of oily hydrocarbons. It passes over with the gas into the condensers along with ammonia liquor, but being heavier than the latter, it is easily separated from it when the whole is allowed to stand. It was formerly of comparatively little use; but in recent years a great number of valuable products have been derived from it by distillation, such as ammonia, naphtha, creosote, carbolic acid, and benzine, while it is also the source of the whole series of aniline colors, and other dyes, of alizarine, salicylic acid, etc. See *Tar.*

Coast Mountains (Coast Range), a range or series of ranges extending along the west of California [illegible] great distance from the Pacific coast, a[illegible]ring to the height of 8,500 ft.

Coatbridge, [illegible]own in Scotland, Lanarkshire, 9½ mi. [illegible] of Glasgow. The district abounds in coa[illegible]d ironstone. Pop. 17,500.

Co'ati (or Coati Mondi), a name of South American plantigrade carnivorous mammals, belonging to the Ursidæ or bears, but recalling rather the raccoon or civets, and having a long proboscis or snout. They feed on worms, insects, and the smaller quadrupeds, but chiefly on eggs and young birds.

Co'balt, a metal, of a grayish white color, very brittle, of a fine close grain, compact, but easily reducible to powder. It crystallizes in parallel bundles of needles. It is never found in a pure state. Its ores are arranged under the following species, viz., *arsenical cobalt*, of a white color, passing to steel gray; its texture is granular, and when heated it exhales the odor of garlic; *gray cobalt*, a compound of cobalt, arsenic, iron, and sulphur, of a white color, with a tinge of red; its structure is foliated, and its crystals have a cube for their primitive form; *sulphide of cobalt*, compact and massive in its structure; *oxide of cobalt*, brown or brownish black, generally friable and earthy; *sulphate* and *arsenate of cobalt*, both of a red color, the former soluble in water. The great use of cobalt is to give a permanent blue color to glass and enamels upon metals, porcelain, and earthenwares.

Cob'bett, William (1762–1835), English writer and politician, was the son of a farmer. In 1783 he went to London and obtained a situation as copying clerk to an attorney, but after nine months he enlisted into the Fifty-fourth Foot, and shortly after went with the regiment to Nova Scotia. Four years later he was promoted to sergeant major. He obtained his discharge, married, and proceeded to America. Under the signature of "Peter Porcupine," he wrote papers and pamphlets of a strongly anti-republican tendency. In 1800 he started first the *Porcupine*, then the *Weekly Political Register*. In 1824–7 appeared his *History of the Reformation*. On the passing of the Reform Bill in 1832 he was returned as member for Oldham. Cobbett is also the author of a *Parliamentary History of England from the Conquest to 1803; Advice to Young Men and Women; Village Sermons*, etc.

Cobb, Howell (1815–1868), American statesman, b. in Cherry Hill, Ga. In 1837 he was elected solicitor general of the western circuit of Georgia, and in 1843 was elected to Congress. In 1849 he was elected speaker. In 1851 he was elected governor of Georgia, serving until 1853. In 1855 he was again elected to Congress, and later was made secretary of the treasury, serving from 1857 to 1860. When the war came up he was appointed brigadier general, and subsequently major general, but took no part in military movements.

Cob'den, Richard (1804–1865), English politician, the "apostle of free trade." After receiving a very meager education he was taken as an apprentice into a warehouse in London. In 1830 he started a cotton manufactory in Manchester. His first political writing was a pamphlet on England, Ireland, and America. In this he gave clear utterance to the political views to which he continued through his life to adhere, advocating non-intervention in the disputes of other nations, and maintaining it to be the only proper object of the foreign policy of England to increase and strengthen her connections with foreign countries in the way of trade and peaceful intercourse. In 1841 he entered Parliament as member for Stockport. Next year he was chosen member for the West Riding of York, a constituency which he represented for ten years. In 1859 he was chosen member for Rochdale. During his later years he lived a good deal in retirement.

Cob'lentz, a fortified town of Germany,

capital of Rhenish Prussia, on the Rhine in the angle between it and the Moselle, and connected by a pontoon bridge over the Rhine with the fortress of Ehrenbreitstein, this, along with its other fortifications, rendering it one of the strongest places in Germany, and capable of accommodating 100,000 men. Its industries embrace cigars, machinery, champagne wines, pianos, and it has an important trade in Rhine and Moselle wines. Pop. 31,669.

Cobourg, a port of Canada, prov. Ontario, on Lake Ontario, 69 mi. e. by n. of Toronto. It is well built, has sundry manufactures, a good harbor, and an increasing trade. Pop. 4,957.

Head of Cobra.

Cobra de Capello (that is, "snake of the hood"), the Portuguese name of the hooded or spectacled snake which is found in Southern Asia, a closely allied species called cobra, or asp, being found in Egypt. It is called spectacled snake from a singular marking on the back of the neck. So exceedingly poisonous is its bite, that in numerous instances death has followed within a few minutes, and under ordinary circumstances a few hours is the longest term where prompt measures have not been taken. In India thousands of natives lose their lives yearly through cobra bites. Its food consists of small reptiles, birds, frogs, fishes (being an excellent swimmer), etc. Its great enemy is the ichneumon.

Co'burg, a town, Germany, capital of the duchy of Saxe-Coburg-Gotha, 106 mi. e. by n. Frankfort-on-the-Main. The principal buildings are the palace of the Duke of Saxe-Coburg-Gotha, and on an eminence overhanging the town the ancient castle of the dukes of Coburg, in which are still shown the rooms occupied by Luther during his concealment here, with his bedstead and pulpit. Coburg has various manufactures, also extensive breweries. Pop. 16,210.

Coca, a South American plant. The leaf is a stimulating narcotic, and is chewed by the inhabitants of countries on the Pacific side of South America, mixed with finely powdered chalk. It has effects somewhat similar to those of opium. A small quantity of it enables a person to bear up against fatigue even when receiving less food than usual; and it prevents the difficulty of respiration experienced in climbing high mountains. Coca leaves depend for their influence on a crystallizable alkaloid called *cocaine*, which, besides having effects similar to the leaf, possesses valuable anæsthetic properties, and in recent times has been especially employed to prevent sufferings in operation on the eye, having also similar effects when applied to the tongue, larynx, ear, etc.

Coca; *a.*—flower; *b.*—fruit.

Coc'culus, a genus of East Indian menispermaceous plants, consisting of climbers with heart-shaped leaves and small flowers. The species are generally powerful bitter febrifuges. The fruit of the *Coccŭlus Indicus*

Cocculus Indicus; *a.*—branch with leaves; *b.*—panicle of female inflorescence; *c.*—a female flower; *d.*—the same with sepals removed; *e.*—male flower; *f.*—fruit.

forms a considerable article of commerce, and is sometimes added to malt liquors to give bitterness.

Coccus, a genus of insects of the order Hemiptera, family Coccidæ, or scale insects. The males are elongated in their form, have large wings, and are destitute of any obvious means of suction; the females, on the contrary, are of a rounded or oval form, about an eighth of an inch in length, have no wings, but possess a beak or sucker, by which they suck up the juices of the plants on which they live. At a certain period of their life the females attach themselves to the plant or tree which they inhabit, and remain thereon immovable

during the rest of their existence. In this situation they are impregnated by the male; after which their body increases considerably, in many species losing its original form and assuming that of a gall, and, after depositing the eggs, drying up and forming a habitation for the young. Some of these insects are troublesome in gardens, plantations, and hothouses, while others are of great value. For example, kermes, cochineal, lac-lake, lac-dye, and gum-lac are either the perfect insects dried, or the secretions which they form. Kermes consist of the dried females of *Coccus ilicis*, found in great abundance upon a species of oak, a native of the Mediterranean basin, and gathered before the eggs are hatched. Cochineal consists of the bodies of the females of the *Coccus cacti*, a native of Mexico, which feeds on various species of cactus, particularly on one called *nopal*.

Cochabam'ba (koch-), a town in the interior of Bolivia, capital of the province of Cochabamba, situated in a fertile valley 8,435 ft. above the level of the sea, with good trade and considerable manufactures. Pop. 26,330.

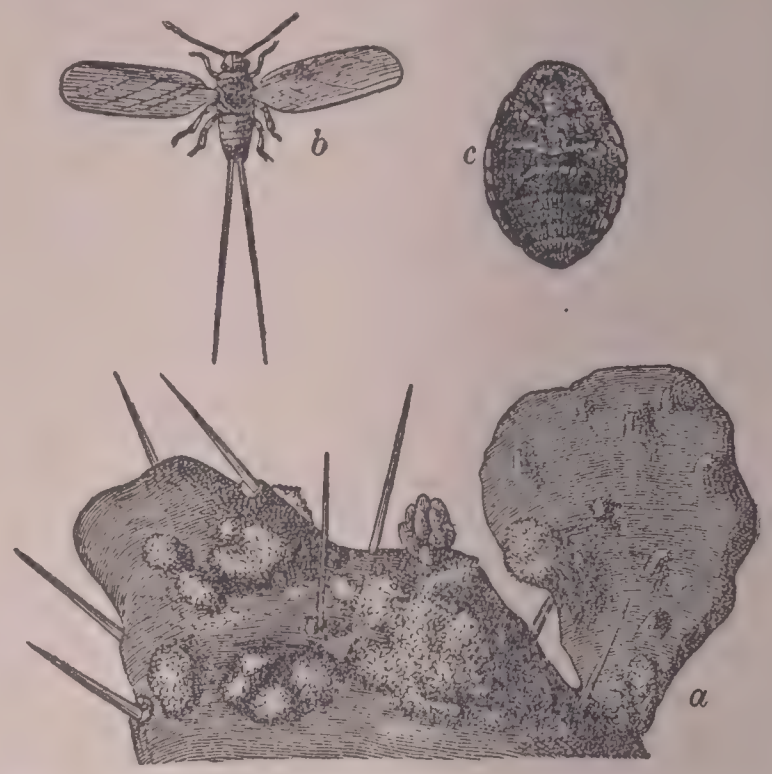
Coch'in, a seaport, Hindustan, Malabar district, Madras presidency. Cochin was one of the first places in India visited by Europeans. In 1502 Vasco da Gama established a factory, and soon after Albuquerque built a fort. In 1663 the Dutch took the place, in 1795 the British. Pop. 15,698.

Cochin-China, a country forming part of the peninsula of Southeastern Asia, and generally regarded as comprising the whole of Anam and Lower or French Cochin-China. The latter belonged to Anam till, in 1863, a portion of it was finally ceded to France after a war occasioned by the persecution of French missionaries; another portion being declared French territory in 1867. The territory thus acquired covers 27,020 sq. mi.; pop. 4,600,000. In the low and wet grounds much rice is grown. In the more elevated districts are grown tobacco, sugar cane, maize, indigo, and betel. Among the other products are tea, gums, cocoanut oil, silk, spices. The climate is hot and unsuited for Europeans. Industrial arts are as yet limited among the natives. But they excel in the use of wood, of which their temples, pagodas, and tombs are built, being ornamented with elaborate carving. The principal export is rice, mainly to China; cotton and silk are also exported.

Cochin-China, a term applied to a variety of domestic fowl, imported from Cochin-China. It is a large ungainly bird, valuable chiefly owing to its fecundity, eggs being laid even during the winter.

Cochineal (koch'i-nēl), a dye-stuff consisting of the dried bodies of the females of a species of insect, *Coccus Cacti* a native of the warmer parts of America, particularly Mexico, and found living on a species of cactus called the cochineal fig. The insects are brushed softly off, and killed by being placed in ovens or dried in the sun, having then the appearance of small berries or seeds. A pound of cochineal contains about 70,000 of them. The

finest cochineal is prepared in Mexico, where it was first discovered. Cochineal produces crimson and scarlet colors, and is used in making carmine and lake.

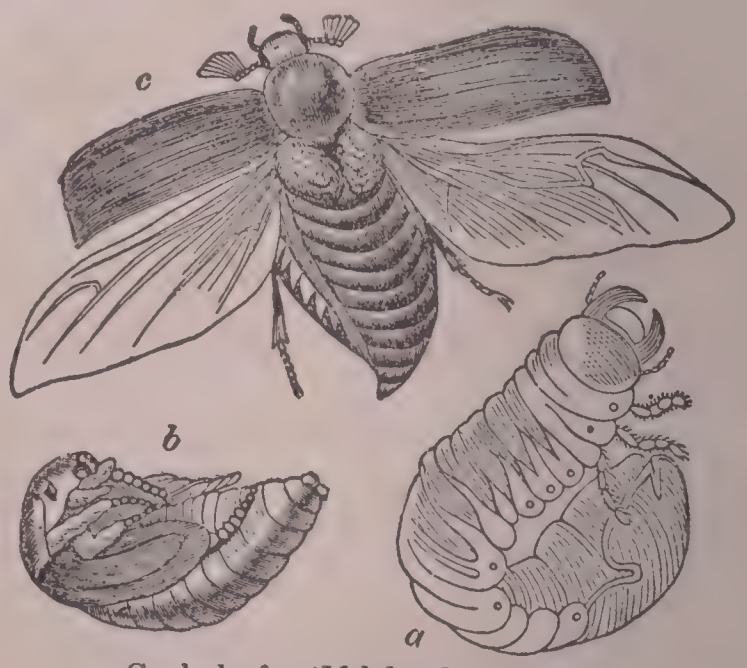


Cochineal; *a.*—living on cactus; *b.*—male; *c.*—female.

Cockatoo', the name of a number of climbing birds belonging to the family of the parrots, or regarded as forming a distinct family. They have a large, hard bill; a crest capable of being raised and lowered at the will of the bird, commonly white, but sometimes yellow, red, or blue; a tail somewhat longer than that of the parrot, and square or rounded long wings; and, for the most part, a white plumage; though in some genera the plumage is dark. They are found especially in the Eastern Archipelago and Australia. They live on roots, fruits, grain, insects, etc., and usually congregate in flocks. These birds are easily tamed.

Cockburn, ALEXANDER (1802–1880), British jurist. He was successively solicitor general, attorney general, and chief justice, and in 1871 was one of the arbitrators of the Geneva claims.

Cock'chafer, a species of lamellicorn beetle remarkabe for the length of its life in the worm



Cockchafer (*Melolontha vulgaris*);
a.—full-grown larva; *b.*—pupa; *c.*—perfect insect,

or larva state, as well as for the injury it does to vegetation after it has attained its perfect condition. The common cockchafer is hatched from an egg which the parent deposits in a hole about 6 in. deep, which she digs for the purpose. At the end of about three months the insect emerges as a small grub or maggot, and feeds on the roots of vegetables in the vicinity. When full grown it is over an inch in length; it makes its way underground and commits great devastation on grass and corn crops. In the fourth year the insect appears as a perfect coleopterous insect—a beetle over an inch long, of a black color, with a whitish down. It usually emerges from the ground about the beginning of May, from which circumstance the name *may bug* or *beetle* has been given it. In its perfect state it is very destructive to the leaves of various trees.

Cock Fighting, an amusement practised in various countries, first perhaps among the Greeks and Romans. At Athens there were annual cock fights, and among the Romans quails and partridges were also used for this purpose. It was long a favorite sport with the British, and the training, dieting, and breeding of cocks for fighting was the subject of many treatises. It is a favorite sport in this country and Cuba.

Cockle, a name for the bivalve molluscs of the genus *Cardium*, common on the sandy shores of the ocean, much used as food. The general characteristics are: shells nearly equilateral and equivalvular; hinge with two small teeth, one on each side near the beak, and two larger remote lateral teeth, one on each side; prominent ribs running from the hinge to the edge of the valve.

Cock of the Rock, a South American bird of a rich orange color with a beautiful crest, belonging to the manakin family.

Cock′roach, a genus of insects belonging to the straight-winged order, characterized by an oval, elongated, depressed body, which is

Common Cockroach.
a.—female; *b.*—male.

smooth on its superior surface. They have parchment-like elytra, and in the female the wings are imperfectly developed. They are nocturnal in their habits, exceedingly agile, and devour provisions of all kinds. Cockroaches, like other orthopterous insects, do not undergo a complete metamorphosis; the larvæ and nymphs resemble the perfect insect, except that they have merely rudiments of wings. The eggs are carried below the abdomen of the female for seven or eight days till she finally attaches them to some solid body by means of a gummy fluid. The species are numerous. The common kitchen cockroach was originally brought from Asia to Europe, and thence to America, where it is now common. The American cockroach grows to be 2 or 3 in. long.

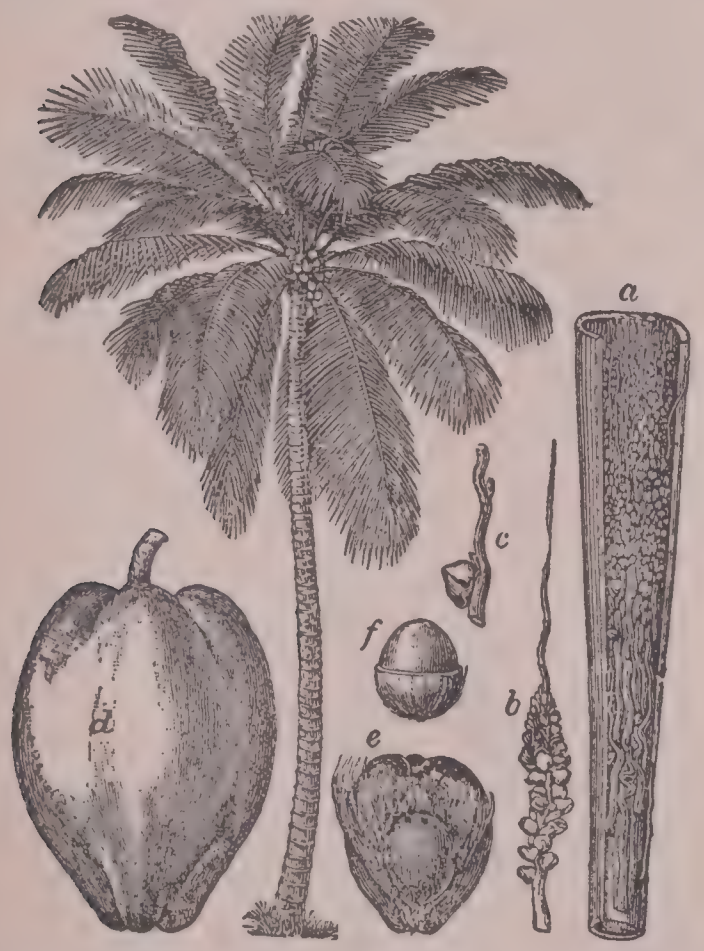
Cock's-foot (Cock's-foot-grass), a perennial pasture grass of a coarse, harsh, wiry texture, but capable of growing on barren, sandy places, and yielding a valuable food for sheep very early in the spring. The name has been given to it because of the resemblance of its three-branched panicle to the foot of a fowl.

Co′coa, a name given to the ground kernels of the cacao or chocolate tree prepared to be made into a beverage. Cocoa is chocolate from which the oil has been extracted. One half of the cocoa bean is cocoa butter. Cocoa butter is used by confectioners in making candy. In making cocoa the chocolate is taken from the machine which grinds it, placed in little canvass bags, and put into a hydraulic press, where a pressure of 70 tons drives the oil out of the chocolate and leaves the cocoa in dry, oilless lumps which are broken with a mallet, and are taken away to be ground up for further operations. If the cocoa is wanted for drinking purposes it is ground into a flour-like substance and packed in tin boxes. If for eating or for confectioners, it is mixed with flavoring compounds in a mixing mill, after the sugar has been thoroughly incorporated with the cocoa by passing the whole mixture through rolls. Several varieties of cocoa are mixed and blended during the process, and it is the success of this blending upon which the quality of the cocoa depends.

Cocoa Butter is a product of the cocoanut. After the milk has been extracted from the cocoanut, the white meats are broken into fine pieces and sent to the mill, where the rich oil is boiled and pressed out of them. A thousand nuts will yield about 25 gallons of oil. This oil is run into huge pipes holding 2,000 to 3,000 pounds each, where it hardens into a pure white substance not unlike tallow. In this form it is shipped to the factories. In the factory the oil is reduced to a rich yellow liquid in large tanks. These tanks are made double, and when the oil is inside it can be raised to a high temperature by the water in the jacket. A solution is put in to kill the fermenting germs of the oil. The oil next goes to the centrifugal machine, where it is mixed with water. The velocity of this revolving bowl is about 4,000 revolutions per minute, and throws off the water and the germ-killing solution through one spout and the oil through another. The oil is carried to the storage tanks, where it is weighed. It then goes into tin vats partly filled with water. Here it is treated to a blast of cold air which granulates the oil until it looks like little lumps of pure white butter floating in butter-

milk. It is skimmed off with large skimmers, leaving the water. It is then loaded into trucks and left in the storeroom for several days to develop acids. It is then put into an ordinary creamery churn and butter worker where the water is thoroughly squeezed out of it. If the butter is to be used for table purposes a little half-churned cream and butter color is put in. The greater part of the cocoanut butter is left white, in which condition it is almost tasteless and odorless. It is used in the kitchen in the place of cheap butter or lard. Cocoanut butter, by chemical analysis, is shown to have the same ingredients as real butter, with the exception of butyric acid, in the place of which it contains lauric acid.

Co′coanut (or Coco-nut), a woody fruit of an oval shape, from 3 or 4 to 6 or 8 in. in length, covered with a fibrous husk, and lined internally with a white, firm, and fleshy kernel. The tree which produces the cocoanut is a palm, from 40 to 60 ft. high. The trunk is straight



Cocoanut Palm (*Cocos nucifera*). *a.*—portion of young spathe, with enclosed inflorescence; *b.*—branch of spadix; *c.*—smaller portion enlarged, showing a female flower below, and male flower above; *d.*—cocoanut; *e.*—husk cut open, showing hard endocarp, at *f* opened to show the single seed.

and naked, and surmounted by a crown of feather-like leaves. The nuts hang from the summit of the tree in clusters of a dozen or more. The external rind of the nuts has a smooth surface. This encloses fibrous substance of considerable thickness, which surrounds the nut. The latter has a thick and hard shell, with three black scars at one end, through one of which the embryo of the future tree pushes its way. The kernel encloses a considerable quantity of sweet and watery liquid, of a whitish color, which has the name of *milk*. This palm is a native of Africa, the East and West Indies, and South America, and is now

grown almost everywhere in tropical countries. Food, clothing, and the means of shelter and protection, are all afforded by the cocoanut tree. The kernels are used as food in various modes of dressing, and yield, on pressure, an oil which is largely imported into various countries. When dried before the oil is expressed, they are known as *copra*. The fibrous coat of the nut is made into the well-known cocoanut matting; the coarse yarn obtained from it is called *coir*, which is also used for cordage. The hard shell of the nut is polished and made into a cup or other domestic utensil. The fronds are wrought into baskets, brooms, mats, sacks, and many other useful articles; the trunks are made into boats, or furnish timber for the construction of houses. By boring the tree a white, sweetish liquor called *toddy* exudes from the wound, and yields by distillation one of the varieties of the spirit called *arrack*. A kind of sugar called *jaggery* is also obtained from the juice by inspissation.

Cocoa Plum, a fruit which is eaten in the West Indies. It is about the size of a plum, with a sweet and pleasant though somewhat austere pulp.

Cocoon′, the name given to the web or ball spun by caterpillars before passing into the chrysalis state. The valuable product thus obtained from the silkworm is well known.

Cod, a genus of well-known, soft-finned fish, is distributed throughout the temperate seas of Europe, Asia, and America. It feeds in water 25–50 fathoms deep. Its voracity inclines it to take greedily almost any bait. The genus is characterized by three dorsal and two anal fins, and a single barbel. The cod is prolific and spawns in February. The roe of a female forms more than half its weight. Roe is used for food, and in France, for bait in sardine fishing. Cod reaches maturity about the end of the third year, but second year cod are marketable. Ordinarily a cod weighs from 12 to 20 lbs., but some have been taken weighing from 50 to 70 lbs. The best months for cod fishing are October, November and December. The most noted cod fisheries in the world are off the coasts of Newfoundland. The London market is supplied from the coasts of Norfolk and Suffolk, where the cod is taken with hook and line and carried to market alive in well-boats. Salted and dried cod are exported to all parts of the world. From the swimming bladder of the cod is obtained isinglass, and from the liver, cod-liver oil, which is used in cases of rheumatism and pulmonary consumption. The Norwegians are said to feed cod heads with marine plants to cows to increase the quantity of milk. Dried cod bones furnish them with fuel. At Point Logan, in Wigtonshire, cod is cultivated in a great reservoir scooped out of solid rock. A barrier of stone through which the water has free egress, prevents the escape of the cod. The fish are fed on mussels and become very tame. Their flavor is superior to that of cod taken from the open sea.

Cod-Liver Oil, an oil extracted from the livers of different kinds of cod — the common

cod being specified in the pharmacopœia — and allied species. The finest and palest oil is got from fresh and carefully cleaned liver, the oil being extracted either in the cold or by a gentle heat. The darker kinds are got at a higher temperature, and often from the livers in a putrefying state. Only the pale oils are used in medicine; the dark oils are too rank and acrid, and they are only used in dressing leather. Cod-liver oil is a somewhat complex substance, but the main ingredients appear to be olein and margarin. Acetic, butyric, and other acids are also present, and to these the oil may owe some of its odor.

Cod′rus, according to Greek legend the last king of Athens. Having learned that the enemies of his country would be victorious, according to the declaration of an oracle, if they did not kill the Athenian king, he voluntarily entered their camp, provoked a quarrel, and was slain. The grateful Athenians abolished the royal dignity, substituting that of archon, esteeming no one worthy to be the successor of Codrus.

Cody, William F. (better known as "Buffalo Bill"), b. in Scott co., Iowa, 1845. He spent the early part of his life among the Indians on the Western frontier until the Civil War broke out, when he offered his services as a Union scout. He rendered valuable service during the war to several commanders. Cody was a member of a camp of U. S. troops which protected the laborers during the construction of the Union Pacific R. R., and took the contract to supply the entire force with fresh buffalo meat for a certain period, hence his soubriquet of "Buffalo Bill." Later he took to the stage, and finally collected a band of Indians, cowboys, rough riders, unbroken bronchos, and a small herd of buffalo, and commenced a series of exhibitions in the principal cities of America. The show is known as the "Wild West." He made a tour through the principal cities of Europe in 1892. He is at present managing this show with success.

Coe, George S., American financier, b. in Newport, R. I., in 1817. He began life as a bank clerk in 1834. In 1855 he became connected with the American Exchange National bank, first as vice-president and later as president. In 1858 he was instrumental in organizing the New York clearing house banks into an association.

Cœlentera′ta, a sub-kingdom of animals, including those whose alimentary canal communicates freely with the general cavity of the body ("the somatic cavity"). The body is essentially composed of two layers of membranes, an outer layer and an inner layer. No circulatory organs exist, and in most there are no traces of a nervous system. Peculiar stinging organs or "thread-cells" are usually present, and in most cases there is a radiate or starlike arrangement of the organs, which is especially perceptible in the tentacles, which are in most instances placed round the mouth. Distinct reproductive organs exist in all, but multiplication also takes place by fission and budding. The Cœlenterata are divided into

two great sections, the Actinozoa and the Hydrozoa, and include the medusas, corals, sea-anemones, etc. They are nearly all marine animals.

Coffee is the seed of an evergreen shrub which is cultivated in hot climates, and is a native of Abyssinia and of Arabia. This shrub is from 15 to 20 ft. in height. The leaves are green, glossy on the upper surface, and the flowers are white and sweet-scented. The fruit is of an oval shape, about the size of a cherry, and of a dark red color when ripe. Each of these contains two cells, and each cell a single seed, which is the coffee as we see it before it undergoes the process of roasting. Great attention is paid to the culture of coffee in Arabia. The trees are raised from seed sown in nurseries and afterward planted out in moist and shady situations, on

Coffee; branch with fruit.

sloping grounds or at the foot of mountains. Care is taken to conduct little rills of water to their roots, which at certain seasons require to be constantly surrounded with moisture. When the fruit has attained its maturity cloths are placed under the trees, and upon these the laborers shake it down. They afterward spread the berries on mats, and expose them to the sun to dry. The husk is then broken off by large and heavy rollers of wood or iron. When the coffee has been thus cleared of its husk it is again dried in the sun, and, lastly, winnowed with a large fan, for the purpose of clearing it from the pieces of husks with which it is intermingled. A pound of coffee is generally more than the produce of one tree; but a tree in great vigor will produce 3 or 4 lbs. The best coffee is imported from Mocha, on the Red Sea. It is packed in large bales, each containing a number of smaller bales, and when good appears fresh and of a greenish olive color. Next in quality to the Mocha coffee may perhaps be ranked that of

Southern India and that of Ceylon, which is strong and well flavored. Java and Central America also produce large quantities of excellent coffee. Brazilian coffee, though produced more abundantly than any other, stands at the bottom of the list as regards quality. Liberian coffee may also be mentioned. Of the best Mocha coffee grown in the province of Yemen little or none is said to reach the Western markets. Arabia itself, Syria, and Egypt consume fully two thirds, and the remainder is exclusively absorbed by Turkish or Armenian buyers. The only other coffee which holds a first rank in Eastern opinion is that of Abyssinia. Then comes the produce of India which those accustomed to the Yemenite variety are said to consider hardly drinkable. The Dutch were the first to extend the cultivation of coffee beyond the countries to which it is native. About 1690 some coffee seeds were brought to Java, where they were planted and produced fruit. By 1718 the Dutch planters of Surinam had entered on the cultivation of coffee with success, and ten years after, it was introduced from that colony by the English into Jamaica, and by the French into Martinique. It was not till 1774 that the planters of Brazil, now the greatest producers of coffee in the world, commenced its cultivation. Coffee as an article of diet is of but comparatively recent introduction. To the Greeks and Romans it was wholly unknown. From Arabia it passed to Egypt and Turkey, whence it was introduced into England. In Great Britain much less is drunk than on the Continent of Europe or in the U. S. and Canada. The excellence of coffee depends in a great measure on the skill and attention exercised in roasting it. If it be too little roasted it is devoid of flavor, and if too much it becomes acrid, and has a disagreeable, burned taste. Coffee is used in the form either of an infusion or decoction, of which the former is decidedly preferable, both as regards flavor and strength. Since the middle of the eighteenth century both the culture and consumption of coffee have continually increased. The principal supply of the U. S. is derived from Brazil, which furnishes 75 per cent. of the whole import. It is known in commerce as "Rio." Coffee acts as a nervous stimulant, a property which it owes mainly to the alkaloid caffeine.

Coffee comes to the roasting factory in coarse gunny sacks, and is dumped into bins. In the factory are rows of iron roasters, in the interior portions of each one of which is a hollow cylinder with a capacity of several hundred pounds and filled with innumerable little holes. Underneath it a strong fire is kept burning. When the raw coffee has been placed in the cylinder, a shaft begins to revolve at a low rate of speed, turning the cylinder and thoroughly mixing the coffee. Each variety of coffee requires a different time for roasting and thus necessitates very experienced workmen in this process. When the coffee berries have swelled up and become just brown enough, the fire is shut off and the cylinders are emptied

and recharged. When the coffee is cool it goes to the packing room where it is shoveled into barrels, bales, sacks, and paper packages, ready for shipment.

Coffer-dam, a temporary wooden enclosure formed in water in order to obtain a firm and dry foundation for bridges, piers, etc. It is usually formed of two or more rows of piles driven close together, with clay packed in between the rows.

Coffin, the chest or box in which a dead body is enclosed for burial. Coffins were used by the ancients mostly to receive the bodies of persons of distinction. Among the Romans it was latterly the almost universal custom to consume the bodies with fire, and deposit the ashes in urns. In Egypt coffins seem to have been used in ancient times universally. They were of stone, earthenware, glass, wood, etc. A sort of ancient coffin is known as a *sarcophagus.* Coffins among Christians were introduced with the custom of burying. Modern coffins are usually made of wood, and are sometimes enclosed in a leaden case. It has recently been proposed to employ coffins of wicker work.

Cognac (kon-yȧk), a town in France, dep. Charente and near the river Charente, 22 mi. w. Angoulême pleasantly situated on a hill, crowned by the remains of an old castle. It is famous for the brandy which bears its name, and which is exported to all parts of the world. Pop. 17,392.

Cogno′vit, in law, is a written confession given by the defendant that the action of the plaintiff is just, or that he has no available defense.

Cohesion Figures, a class of figures produced by the attraction of liquids for other liquids or solids with which they are in contact, and divided into *surface, submersion, breath,* and *electric, cohesion figures.* Thus a drop of an independent liquid, as oil or alcohol, will spread itself out on the surface of water always in a definite figure, but differing with each fluid dropped on the water. *Breath figures* are produced by putting a drop of the liquid to be examined on a slip of mica, and breathing on it, when each fluid takes a distinct characteristic shape. *Electric cohesion figures* are produced by electrifiying drops of various liquids placed on a plate of glass.

Cohoes, Albany co., N. Y., on Hudson River, at the mouth of the Mohawk River and Erie Canal. It has the Del. & Hud. Canal Co., the N. Y. C. & H. R. railroads. Industries: cotton mills, knitting mills, tube works, rolling mills, ax factories, foundries, and machine shops. Pop. 1900, 23,910.

Coimbatore, a town of Hindustan, Madras presidency, capital of district to which it gives name. Pop. 46,383. The district has an area of 7,860 sq., mi. It is fertile, producing sugar, cotton, rice, and tobacco; and well watered by several rivers. Pop. 2,004,839.

Coimbra (ko-im′brȧ), a city of Portugal, province of Beira. It contains an old and a new cathedral, a hospital, and a university which is the only one in the kingdom. Manufactures: linen, pottery, articles of horn. The

environs produce oil, wine, lemons, and oranges of excellent quality. Pop. 51,226.

Coining, the art of converting pieces of metal into current coins for the purposes of commerce, usually performed in a government establishment called a *mint.* It is one of the prerogatives of the supreme power in all states, and counterfeiting or otherwise tampering with the coin is severely punished. In the U. S. the Bureau of the Mint was established as a division of the Treasury Department in 1873. It has charge of the coinage for the government and makes assays of precious metals for private owners. The rolling machines are four in number. The rollers are adjustable, and the space between them is governed by the operator. About 200 ingots are run through per hour on each pair of rollers. When the rolling is completed the strip is about 6 ft. long. As it is impossible to roll perfectly true it is necessary to "draw" these strips, after being softened by annealing. The drawing benches resemble long tables, with a bench on either side, at one end of which is an iron box secured to the table. In this are fastened two perpendicular steel cylinders. These are at the same distance apart that the thickness of the strip is required to be. It is drawn between the cylinders, which reduces the whole to an equal thickness. These strips are now taken to the cutting machines, each of which will cut 225 planchets per minute. The press now used consists of a vertical steel punch. From a strip worth $1,100 about $800 of planchets will be cut. These are then removed to the adjusting room, where they are adjusted. After inspection they are weighed on very accurate scales. If a planchet is too heavy, but near the weight, it is filed off at the edges; if too heavy for filing, it is thrown aside with the light ones to be remelted. The planchets, after being adjusted, are taken to the coining and milling rooms, and are passed through the milling machine. The planchets are fed to this machine through an upright tube, and as they descend are caught upon the edge of a revolving wheel and carried about a quarter of a revolution, during which the edge is compressed and forced up. By this apparatus 560 half dimes can be milled in a minute; for large pieces the average is 120. The massive but delicate coining presses coin from 80 to 100 pieces a minute. These presses are attended by women. After being stamped the coins are taken to the coiner's room. The light and heavy coins are kept separate in coining, and when delivered to the treasurer they are mixed in such proportions as to give him full weight in every delivery. By law, the deviation from the standard weight, in delivering to him, must not exceed three pennyweights in 1,000 double eagles.

Coir, cocoanut fiber, fiber from the husk of the nut, from which are manufactured matting, bagging, ropes, and cables. Coir cordage, from lasting well in salt water, as also from its lightness, strength, and elasticity, is preferable in many respects to ropes of hemp. Mats and

matting are now largely made of coir, which is also used in coarse brushes, for stuffing purposes, etc.

Coke, the carbonaceous residue of coal which has been heated in an oven or retort, or in any way by which little air is admitted, until all volatile matter has been expelled. The simplest method of producing coke is based on the preparation of wood charcoal, the coal being arranged in heaps, which are smothered with clay or coal dust, and then set on fire, sufficient air being admitted to keep the mass at the proper temperature for decomposition without wasting the coke. After the volatile portions are got rid of, the heap is allowed to cool, or is extinguished with water, and the coke is then ready. Methods of heating the coal in close or open ovens until the gaseous and fluid products are driven off are also commonly used. Gas coke is that which remains in the retorts after the gas has been given off. Good oven coke has an iron-gray color, sub-metallic luster, is hard, and somewhat vesicular; but gas coke has rather a slagged and cindery look, and is more porous. Coke contains about 90 per cent. of carbon, and is used where a strong heat is wanted without smoke and flame, and it is accordingly largely consumed in drying malt and similar purposes. It used to be burned regularly in locomotive engines, but raw coal is now commonly substituted. The largest quantities are consumed in smelting operations.

Coke, Sir Edward (1551–1634), an eminent English lawyer. He was chosen recorder of the cities of Norwich and of Coventry, knight of the shire for his county, and, in spite of the rivalship of Bacon, attorney general. As such he conducted the prosecutions for the crown in all great state cases. In 1613 he became chief justice of the Court of King's Bench. In 1621 he was committed to the Tower, and soon after expelled from the privy council, In 1628 he was chosen member for Buckinghamshire. On the dissolution of the Parliament he retired to his seat in Buckinghamshire, where he died. His principal works are legal text books of the highest value.

Colberg (or Kolberg), a Prussian fortified seaport in Pomerania. Pop. 16,027.

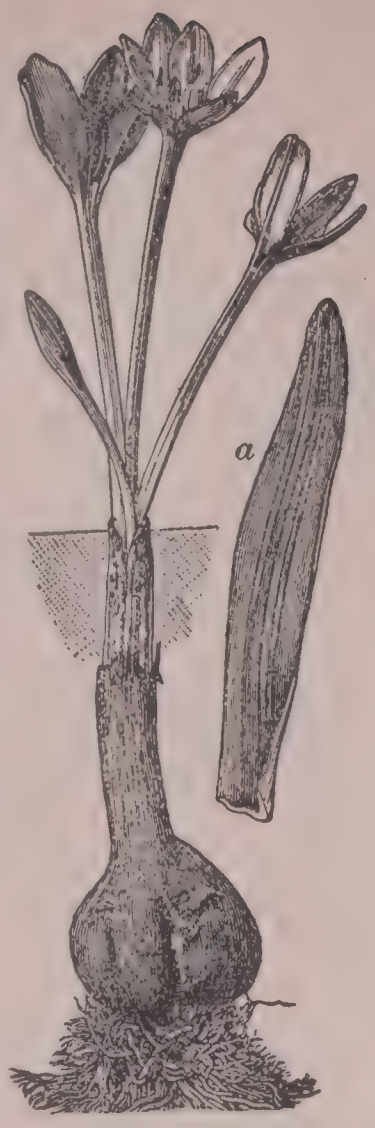
Colbert (kol-bār), Jean Baptiste (1619–1683), a celebrated French minister of finances. He was made intendant, and at length comptroller general of the finances. He instituted many reforms.

Colburn, Zerah (1804–1840), "the calculating boy," b. in Vermont. Before his sixth year he began to manifest wonderful powers of arithmetical computation, and in public exhibitions astounded learned mathematicians by the rapidity and accuracy of his processes, but the faculty left him when he grew up. After acting as a teacher and itinerant preacher, he was latterly professor of languages at Norwich University, Vermont.

Col'chester, a borough of England, county Essex. It has a good coasting trade and employs a great number of small craft in the oyster fishery. It is a place of high antiquity,

there being no place in the kingdom where so great a quantity and variety of Roman remains have been found as here. Pop. 34,559.

Colchicum (kol'chi-kum), a genus of plants, allied to the lilies. The meadow saffron is a bulbous-rooted, stemless, perennial plant, which grows in various parts of Europe. From a small corm or bulb buried about 6 in. deep, and covered with a brittle brown skin, there rises in the early autumn a tuft of flowers having much the appearance of crocuses, flesh-colored, white, or even variegated. They soon wither, and the plant disappears till the succeeding spring, when some broad leaves are thrown up by each corm along with a triangular oblong seed-vessel. The plant is acrid and poisonous.



Meadow Saffron.

Cold Cream, a cooling ointment prepared in various ways. A good variety may be made by heating four parts of olive oil with one of white wax. This ointment cools the skin, rendering it soft and pliable,

Colden, CADWALLADER (1688–1776), colonial physician, b. in Dunn, Scotland. In 1708 he came to this country and practised medicine in Philadelphia until 1715, when he visited Scotland, and returned to Philadelphia in 1716. In 1718 he removed to New York, and obtained a patent for land near Newburg. In 1719, he became the first surveyor general of the province, and master in chancery. He was appointed a member of the council in 1720, and was a Royalist, and an advocate of the taxation of the colonies. In 1760, he was made president of the council, and, in 1761, lieutenant-governor, which office he held until his death.

Coldwater, Branch co., Mich., on Coldwater River, 87 mi. from Toledo. Railroad, L. S. & M. S. Industries: numerous mills and factories. It is the site of the state public school. Pop. 1900, 6,216.

Cole, THOMAS (1801–1848), landscape-painter. He was b. in England, but was taken quite young to America. Among his works are the *Voyage of Life*, *Course of Empire*, *Hunter's Return*, *Views in the White Mountains*, etc.

Coleop'tera, an order of insects, commonly known as *beetles*. They have four wings, of which the two superior are not suited to flight, but form a covering and protection to the two inferior, and are of a hard and horny or parchment-like nature. The inferior wings, when not in use, are folded transversely under the superior. The coleoptera undergo a perfect metamorphosis. The larva generally resembles a short thick worm with six legs and a scaly head and mouth.

Coleraine (kōl-rān'), a town, Ireland, county of Londonderry, 47 mi. n.w. of Belfast. Its trade, chiefly in linen, agricultural produce, and provisions, is considerable. Pop. 6,845.

Coleridge, the name of an English family famous in literature and law. The most distinguished of its members were Hartley Coleridge (1796–1849), Henry Nelson Coleridge (1800–1843), and the poet Samuel Taylor Coleridge (1772–1834). The latter was b. at Ottery St. Mary, Devonshire, of which his father was vicar. From Christ's Church he went with a scholarship to Jesus College, Cambridge, where he remained for two years. In 1795 he was married to Miss Fricket of Bristol. In 1796 he took a cottage at Nether Stowey, in Somersetshire, where he wrote much of his best poetry. While residing at Nether Stowey he used to officiate in a Unitarian chapel at Taunton, and in 1798 received an invitation to take the charge of a congregation of this denomination at Shrewsbury. Later he made a trip to Germany, where he studied at the University of Göttingen. In 1800 he returned to England and took up his residence beside Southey at Keswick, while Wordsworth lived at Grasmere in the same neighborhood. From this fact, and a certain common vein in their poetry, arose the epithet of "*Lake School*" applied to their works. About 1804 Coleridge went to Malta to re-establish his health, seriously impaired by opium-eating. In 1806 he returned to England, and after ten years of somewhat desultory literary work as lecturer, contributor to periodicals, etc., Coleridge took refuge from the world in the house of a friend at Highgate, London. Here he passed the rest of his days.

Colfax, SCHUYLER (1823–1885), American statesman, b. in New York City. He entered Congress in 1854 and served until March, 1869. From Dec. 7, 1863, to March 4, 1869, he was speaker of the house. He was elected vice president of the U. S. in 1868.

Coligny (kol-in-yē), GASPARD DE (1517–1572), French admiral. He was made admiral of France in 1552. On the night of St. Bartholomew's, Coligny was basely slaughtered.

Colima (kō-lē'mȧ), a town of Mexico, capital of the state of same name, situated in a fertile plain encircled by hills above which rises the lofty volcano of Colima. Pop. about 25,736. On the coast about 30 mi. s.s.w. of the city is the port, Puerto de Colima, or Manzanillo. The state has an area of 2,272 mi.; pop. 73,026.

Col'lege, in a general sense, a body or society of persons invested with certain powers and rights, performing certain duties, or engaged in some common employment or pursuit. In the U. S. and England some societies of physicians are called colleges. The most familiar application of the term college, however, is to a society of persons engaged in

the pursuits of literature, including the professors, lecturers, or other officers, and the students. As applied to an educational institution the name is somewhat loosely used. The higher class of colleges are those in which the students engage in study for the purpose of taking a degree in arts, medicine, or other subjects, and are connected with, or have more or less the character of, universities. The early history of these institutions is somewhat obscure; the probability is that they were originally founded in the various universities of the Middle Ages, with similar objects and from the same charitable motives. Hostels or boarding houses were provided (principally by the religious orders for the benefit of those of their own fraternity), in which the scholars lived under a certain superintendence, and the endowment of these hostels by charitable persons for the support of poor scholars completed the foundation of a college. Out of this has developed the modern college of which there are about 500 in the U. S.

College Fraternities, or "Greek letter" societies, as they are often called, are organizations of students in colleges and universities of the U. S. They receive their names from two or more letters of the Greek alphabet, as *Delta Kappa Epsilon.* Each of these letters is the beginning of a word of the secret motto of the fraternity. The purpose of such societies is literary and social. A fraternity is made up of several chapters in various colleges throughout the Union. Each fraternity has a general government and holds conventions either annually or bi-annually. There are also some local fraternities which have but one chapter. The number of chapters in various fraternities varies from four to seventy-five. There are several professional fraternities, as medical, law, and dental fraternities, etc. There are several similar organizations of young women known as *sororities.* The first fraternity formed was *Phi Beta Kappa*, now an honorary fraternity. This was founded at William and Mary's College, Va., in 1776. There are at present over a hundred college fraternities in the U. S. Among the earliest fraternities founded after the *Phi Beta Kappa*, were *Alpha Delta Phi* in 1832, at Hamilton College, N. Y.; *Kappa Alpha* in 1835, at Union College, N. Y.; *Beta Theta Pi* at Miami College, O.; *Delta Kappa Epsilon* in 1844, at Yale; *Psi Upsilon* in 1833, at Union College, N. Y.

College Point, Queens co., N. Y., on Long Island Sound, 3 mi. n. of Flushing. Railroad, Long Island. It has some manufactures, principally of India-rubber goods. A part of Queens borough, Greater New York.

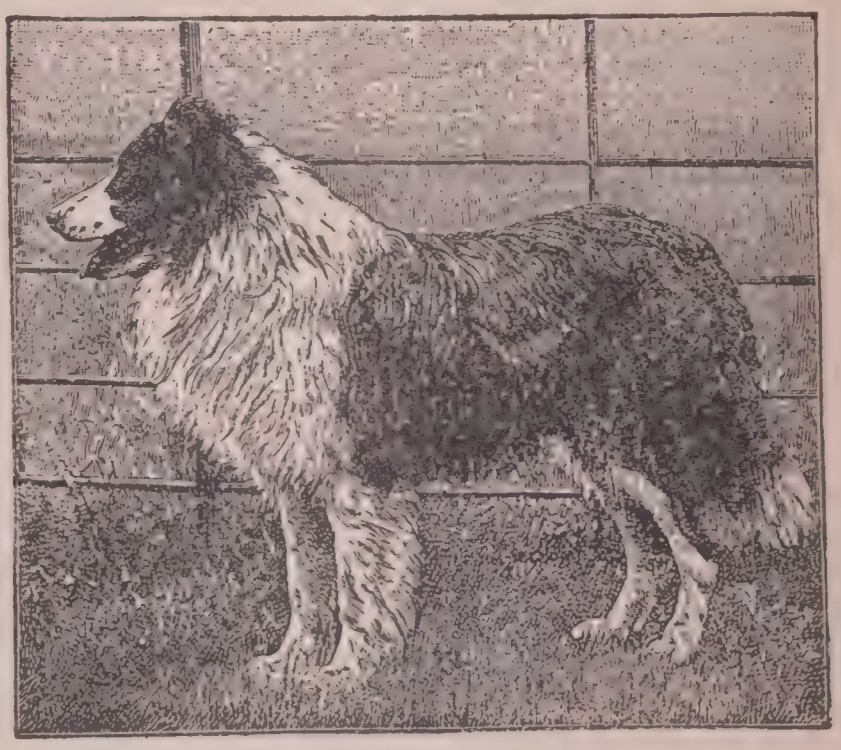
Collie, a variety of dog especially common in Scotland, and from its intelligence of much use to shepherds. It is of medium size and varies much in coloring, black and white being common, and black with tan-colored legs, muzzle, etc., being highly esteemed. The head is somewhat fox-shaped, the ears erect, but with drooping points, the tail rather bushy, and with a strong curl.

Col'lier, JEREMY (1650–1726), English divine and political writer. He obtained the rectory of Ampton in Suffolk in 1659. He is chiefly remembered now for his *Short View of the Immorality and Profaneness of the English Stage*—a work of some merit which is said to have effected a decided reform in the sentiments and language of the theater.

Collier, JOHN PAYNE (1789–1883), English Shakespearian critic. In 1831 his best work, the *History of English Dramatic Poetry*, was published. In 1842–44 he published an annotated edition of Shakespeare in 8 vols.; in 1844 *Shakespeare's Library.*

Collimation, LINE OF, in an astronomical instrument, such as a telescope or transit instrument, the straight line which passes through the center of the object glass and intersects at right angles a system of spider threads placed at the focus of the eye piece. The proper adjustment of the line of collimation of the instrument is necessary to accurate observation of the time at which movements of the heavenly bodies take place.

Collins, WILLIAM (1721–1759), English poet. While studying at Oxford he wrote his *Oriental Eclogues.* In 1746 he published his *Odes.*



Collie.

Collins, WILLIAM WILKIE (1824–1889), a noted British novelist. Among his best known works are *Antonina, Basil, After Dark, The Woman in White, The New Magdalen, The Evil Genius,* etc.

Collo'dion, a substance prepared by dissolving pyroxiline (gun cotton) in ether, or in a mixture of ether and alcohol, which forms a useful substitute for adhesive plaster in the case of slight wounds. When the fluid solution is applied to the cut or wound it immediately dries into a semitransparent, tenacious film, which adheres firmly to the part, and under it the wound or abrasion heals without inflammation. In a slightly modified form collodion is also employed as the basis of a photographic process called the *collodion process.*

Collyer, ROBERT, Unitarian clergyman, b. in

England, 1823. He attended a night school for two winters, and, at the age of fourteen, was apprenticed to a blacksmith. In 1850 he came to this country and worked as a hammer maker in Shoemakertown, Pa., and preached on Sundays. In 1860 he organized Unity Church, of Chicago, of which he was the pastor until 1879, when he removed to New York to assume charge of the Church of the Messiah, which post he still (1897) holds.

Col′mar (or Kolmar), a city of Germany, in Upper Alsace, formerly in the French department of Haut Rhin, 39 mi. s.s.w. Strassburg. It has manufactures of printed goods, calicoes, silks, etc., besides cotton mills, tanneries, etc. It was united to France in 1697 by the Peace of Ryswick, and surrendered to Germany by the Treaty of Versailles, Feb, 26, 1871. Pop. 30,399.

Coloca′sia, a genus of plants, nat. order Arceæ, the leaves and tuber of which are acrid. The latter contain much starchy matter, and they are used as food in the south of Europe after the acrid matter is separated by washing or boiling.

Cologne (ko-lōn′), a city of Rhenish Prussia, on the left bank of the Rhine, forming, in connection with Deutz, a fortress of the first rank. The old fortifications, dating from the Middle Ages, are being, or have been recently, swept away, new works being constructed. There are many fine old buildings as well as excellent modern ones; the churches in particular are interesting. The most important edifice of all is the cathedral, begun in 1248, one of the finest and largest Gothic structures in Europe. The manufactures embrace sugar, tobacco, glue, carpets, leather, machinery, chemicals, pianos, and the celebrated *eau de Cologne.* The trade is very great. Pop. 161,401.

Cologne Yellow, a pigment consisting of 2 parts yellow chromate of lead, 1 of sulphate of lead, and 7 of sulphate of lime or gypsum. It is prepared by precipitating a mixture of nitrate of lead and nitrate of lime with sulphate of soda and chromate of potash.

Colom′bia, Republic of, formerly called New Granada, a republic of South America, consisting of nine departments or states of Antioquia, Bolivar, Boyaca, Cauca, Cundinamarca, Magdalena, Panama (or Istmo), Santander, and Tolima. Pop. 3,907,524. The chief towns are Bogota, the capital, Medellin, and Panama. The territory of the republic includes the whole of the Isthmus of Panama, to the borders of Costa Rica, the Pacific coast south to Ecuador, and that of the Caribbean Sea east to Venezuela; but there is much disputed boundary territory in the inland regions toward the south and east. The area is estimated officially at 504,773 sq. mi. According to surface conformation the country may be divided into the elevated region of the Cordilleras in the west, and that of the low-lying lands in the east. The former occupies the greater portion of the country and presents a richly-diversified surface, being formed chiefly of three mountain chains which stretch north and south in a nearly parallel direction, enclosing between them the valleys of the rivers Cauca and Magdalena. These, the two great navigable rivers of the country, flow northward, joining their waters about 120 mi. from their embouchure in the Caribbean Sea. In the central ridge is the culminating point of Colombia, the volcano of Tolima, 18,315 ft. high. The low lands of the east form a transitionary region between the plains of North Brazil and the llanos of the Orinoco region, the drainage being carried to the Amazon and Orinoco. The chief coast indentations are the Gulfs of Panama and Darien. The climate is naturally as varied as the surface of the country, but over a great part of the republic is very hot. At Cartagena on the Caribbean Sea, and on the Pacific coast, yellow fever is endemic at some places; while on the elevated country, as the plain of Bogota, 8,000 ft. above the sea, the climate is perfectly salubrious, and the temperature seems that of eternal spring. The flora is rich and luxuriant. A great part of the country is still covered with virgin forests, which yield excellent building wood, Peruvian bark, caoutchouc, vanilla, etc. The fauna includes the jaguar, puma, tapir, armadillo, sloth, various species of deer, and the gigantic condor. The mineral wealth is various and abundant. It comprises coal, gold, silver, emeralds, and salt. Industry is at a very low stage. Maize, bananas, and plantains are the chief articles of food. Tobacco and coffee are cultivated and exported. Sugar is also grown. Manufactures can scarcely be said to exist, Panama hats, mats, and coarse cotton cloths being almost the only articles that can be mentioned in this class. The chief ports are Barranquilla, Cartagena, Colon, and Panama. The possession of the Isthmus of Panama and the small line of railway (48 mi. long) which runs between Panama on the Pacific and Aspinwall on the Atlantic gives Colombia considerable commercial importance, which is likely to be increased by the canalization of the isthmus, if this is ever completed. The foreign trade is chiefly with Britain and the U. S. The exports are chiefly precious metals, hides, coffee, tobacco, etc.; the imports, manufactured goods. There are several short lines of railway. The money standard is the *peso* or dollar, nominal value $1. By the constitution, as amended in 1886, the executive power is vested in a president elected for six years, the legislative power in a congress of two houses — the senate and the house of representatives. The former consists of 27 representatives, 3 from each department, and 6 members nominated by the president; the latter, of representatives elected for four years, one for every 50,000 inhabitants. The revenue is generally under the expenditure and the finances are in an unsatisfactory state. New Granada was discovered by Alonso de Ojeda in 1499; it was visited by Columbus on his fourth voyage, in 1502. The first Spanish settlement was made in 1510 at Santa Maria in the Gulf of Darien, and the whole country

was formed into a province under a captain general in 1547. New Granada declared its independence of Spain in 1811, and after eleven years of warfare succeeded with the help of Venezuela in effecting its liberation. Both states then united with Ecuador, also freed from the Spanish domination, to form the first republic of Colombia; but internal dissensions arising, the three states again separated in 1831, forming three independent republics, which have had a very troubled existence. In 1861 the states forming New Granada by agreement adopted a new constitution, the republic henceforth to be called the United States of Colombia. This title was retained till, by the new constitution adopted in 1886, the state ceased to be a federal republic and became a unitary republic with the name of Republic of Colombia. Its recent history has presented a series of civil broils, notably the one that broke out in October, 1899, and continued for over a year and a half. The cause of the revolution was the bad financial condition of the government. The country was placed under martial law by President San Clemente. In the spring of 1900 the rebels were very successful, but in July they were so severely defeated that they were forced to treat for peace.

On the last day of July President San Clemente was seized by Vice-President Monoquin who then reported that the President had retired on account of old age. Later the facts became known and San Clemente was released and opposed Monoquin. San Clemente was induced to retire on a pension and Monoquin became president. In October the revolution broke out again and continued for several months. The revolutionists notified the Panama Canal Co. that in case of success the recent extension of time in which to complete the canal would not be recognized.

Colon′, (or Aspinwall) (the former is the official name), a free port of Colombia, on Manzanillo Island, on the north side of the Isthmus of Panama, at the Atlantic extremity of the interoceanic railway, and near that of the Panama Canal. Established in connection with the railway, it had an important transit trade before the canal was begun, and since then the place has been entirely transformed, a new town with wide and regular streets having been built on a tract of land reclaimed by the Canal Company. There is extensive harbor accommodation. Pop. 10,956.

Colon′na, Cape, the southern extremity of Attica, Greece. Its summit is crowned by the ruins of a temple of Athena 269 ft. above the sea, of which sixteen columns of white marble are still standing.

Colon′na, Vittoria (1490–1547), the most renowned poetess of Italy, was the daughter of Fabrizio Colonna, high constable of Naples. At the age of seventeen she was married to Ferdinand, Marquis of Pescara, who became one of the distinguished men of his age. All her poems were devoted to the memory of her husband. Her most celebrated work is the *Rime Spirituali.*

Col′ony, a settlement formed in one country by the inhabitants of another. Colonies may either be formed in dependence on the mother country or in independence. In the latter case the name of the colony is retained only in a historical sense. Properly, perhaps, the term should be limited to a settlement which carries on a direct cultivation of the soil, as in the Dominion of Canada or Australia; such settlements as those of the British in Hindustan or Malta being the mere superposition on the natives of a ruling race which takes little or no part in the general industry of the country. Sometimes the ambition of extending territory and the desire of increasing wealth have been the chief impulses in colonization; but colonies may now be said to have become a necessity for the redundant population of European states. Among ancient nations the principal promoters of colonization were the Phœnicians, the Greeks, and the Romans; the greatest colonizers in modern times have been the English and the Spaniards, next to whom may be reckoned the Portuguese, the Dutch, and the French. The Germans have latterly contributed largely to the tide of emigration, particularly in the direction of America; but they have done little directly as colonizers. The Phœnician colonies were partly caused by political dissensions and redundant population, but were chiefly commercial, serving as entrepôts and ports of repair for Phœnician commerce along the coasts of Africa and Spain, in the latter of which they numbered, according to Strabo, more than two hundred. But it was in Africa that the most famous arose, Carthage, the greatest colonizing state of the ancient world. The Greek colonies, which were widely spread in Asia Minor and the islands of the Mediterranean, the coasts of Macedonia and Thrace, in South Italy and Sicily, were commonly independent, and frequently soon surpassed the mother states in power and importance. The colonies of Rome were chiefly military, and while the empire lasted were all in strict subordination to the central government. As the Roman power declined the remains of them amalgamated with the people among whom they were placed, thus forming in countries where they were sufficiently strong what are known as the Latin races, with languages (Spanish, Portuguese, French, and Italian) which are merely modifications of the old Roman tongue. Before America and the way by sea to the East Indies were discovered, the only colonies belonging to European states were those of the Genoese, Pisans, and Venetians in the Levant and the Black Sea, flourishing establishments on which the mercantile greatness of Italy in those days was largely built.

The *Portuguese* were the first great colonizers among modern states. In 1419 they discovered Madeira, the Azores, and the Cape Verd Islands; the Congo and the Cape of Good Hope followed; and before the century was out Vasco da Gama had landed at Calicut on the Malabar coast of India. The first Portuguese colonies were garrisons along the coast where they traded: Mo-

zambique and Sofala on the east coast of Africa, Ormuz and Muscat in the Persian Gulf, Goa and Damao on the west coast of India. Colonies were established in Ceylon in 1505, in the Moluccas in 1510. Brazil was discovered in 1499, and this magnificent possession fell to Portugal, and was colonized about 1530. Bad government at home and the subjection of the country to Spain caused the loss of most of the Portuguese colonies. The Portuguese now possess several territories in Asia, at Goa, Damao, and Diu, India; Macao, China; and some islands in the Indian Archipelago. In Africa they possess the Cape Verd and other islands; settlements in Senegambia, Guinea, Mozambique, Sofala, Angola, Benguela, Mossamedes, formally amounting in area to about 700,000 sq. mi.; but Portuguese influence is really limited to a very small portion of this.

Soon after the Portuguese the *Spaniards* commenced the work of colonization. In 1492 Columbus, on board of a Spanish vessel, discovered the island of San Salvador. Hayti, or San Domingo, Porto Rico, Jamaica, and Cuba were soon colonized, and before the middle of the sixteenth century Mexico, Ecuador, Venezuela, New Granada, Peru, and Chile were subdued, and Spain took the first rank among the colonizing powers of Europe. But the Spaniards never really attempted to develop the industrial resources of the subject countries. The pursuit of mining for gold or silver occupied the colonists almost exclusively, and the enslaved natives were driven to work themselves to death in the mines. Cities were founded, at first along the coasts, for the sake of commerce and as military posts, afterward also in the interior, in particular in the vicinity of the mines, as Vera Cruz, Cumana, Porto Bello, Carthagena, Valencia, Caracas; Acapulco and Panama on the coast of the Pacific; Lima, Concepcion, and Buenos Ayres. The colonial intercourse with Spain was confined to the single port of Seville, afterward to that of Cadiz, from which two squadrons started annually—the *galleons*, about twelve in number, for Porto Bello; and the fleet, of fifteen large vessels for Vera Cruz. When the power of Spain declined, her colonies in America declared their independence, and Cuba, Puerto Rico and the Philippines were ceded to the United States at the close of the Spanish-American war. The Ladrone Islands were sold to Germany in June, 1899, and Spain now owns only a few small places in India and Africa.

The hate of Philip II, who prohibited Dutch vessels from the port of Lisbon, forced the Dutch to import directly from India or lose the large carrying trade they had acquired. Several companies were soon formed, and in 1602 they were united into one, the Dutch East India Company, with a monopoly of the East India trade and sovereign powers over all conquests and colonies in India. The Dutch now rapidly deprived the Portuguese of nearly all their East Indian territories, settled a colony at the Cape of Good Hope (1650), established a West India Company, made extensive conquests in Brazil (1623–60), which were soon lost, and more permanent ones on some of the smaller West India Islands, as San Eustatia, Curaçoa, Saba, etc. The growing power of the British and the loss of Holland's independence during the Napoleonic wars were heavy blows to the colonial power of the nation. But the Dutch still possess numerous colonies in the East Indies, among which the more important are Java, Sumatra, Dutch Borneo, the Molucca Islands, and part of New Guinea, also several small islands in the West Indies, and Surinam. No colonizing power of Europe has had a career of such uniform prosperity as Great Britain. The English attempts at colonization began nearly at the same time with the Dutch. After many fruitless attempts to find a northeast or northwest passage to the East Indies, English vessels found their way round the Cape of Good Hope to the East Indies in 1591. The East India Company was established in 1600. English commerce with India, however, was not at first important, and they possessed only single factories on the continent up till the beginning of the eighteenth century. The ruin of the Mogul Empire in India after the death of Aurengzebe (1707) afforded the opportunity for the growth of British power, as the British and French were compelled to interfere in the contentions of the native princes and governors. The French appeared at first to maintain the superiority; but the British in turn got the upper hand, and the victory of Clive at Plassey in 1756 laid the foundation of an exclusive British sovereignty in India. By the middle of the next century the British territory embraced, with the exception of a few dependent states, nearly the whole of India, and this vast territory was still under the government of the East India Company—a mercantile company, controlled indeed by Parliament, but exercising many of the most important functions of an independent sovereignty. On the suppression of the Indian mutiny (1857–58) the government of India was transferred to the crown by act of Parliament in 1858.

The discoveries of the Cabots, following soon after the voyages of Columbus, gave the English crown a claim to North America, which, though allowed to lie dormant for nearly a century, was never relinquished, and which, in the reign of Elizabeth, led to colonization on a large scale. Raleigh's settlement on Roanoke Island (North Carolina), in 1585, failed to become permanent, but in 1607 the colonists sent out by the London Company to Chesapeake Bay founded Jamestown, on the James River, in Virginia. The next great settlement was that of the Pilgrim Fathers, who landed Dec. 21, 1620, in Massachusetts Bay. The colonization of New Hampshire, Maine, New Jersey, Connecticut, Rhode Island soon followed. In the state of New York and the Hudson River territory the British found the Dutch already in possession, but in 1654 they seized the colony of New Amsterdam by force, changing its name to New York in honor of James, duke of York. Pennsylvania was

founded by William Penn, and colonized with Quakers in 1682; Maryland in 1631 by a party from Virginia; Carolina in 1670, and Georgia in 1732 by colonies from England. Colonies were early established in the West India Islands, including Barbadoes, half of St. Christopher's (1625), and soon after many smaller islands. Newfoundland was taken possession of in 1583, colonized in 1621 and 1633. Canada was surrendered to Britain at the peace of Paris, in 1763. In 1764 began the disputes between Britain and its North American colonies, which terminated with the acknowledgment of the independence of the U. S., Canada still remaining a British dependency.

Australia was discovered in the beginning of the seventeenth century. The first Australasian settlements of Britain were penal colonies. New South Wales, discovered in 1770, was established as a penal colony in 1788; Tasmania (Van Dieman's Land), discovered by Tasman in 1642, followed in 1803; West Australia, also first used as a penal settlement, became a free colony in 1829; Victoria (Port Philip) was colonized in 1835, and made an independent colony under its present name in 1851; South Australia was settled in 1836; New Zealand, discovered by Tasman in 1642, began to be used for whale fishery about 1790, was settled in 1839, and made a colony in 1840. In 1851 the discovery of the abundance of gold in Victoria gave a great impetus to the prosperity of the Australian colonies. In 1874 the Fiji Islands, and in 1884 part of New Guinea, were annexed as crown colonies. In South Africa Cape Colony, first settled by the Dutch in 1652, became an English colony in 1814. The latest annexations in this quarter are Griqualand West (1880), the Transkeian Territories (1875–84), Walfisch Bay (1884), and Bechuanaland (1885). Further north are the crown colonies—Lagos, the Niger Districts, the Gold Coast, Gambia, and Sierra Leone—all, except Lagos, which was acquired in 1861, ancient possessions of Britain. In Europe Great Britain has a few colonies acquired for military reasons—Gibraltar in 1704; Malta and Gozzo 1800, Heligoland 1807 (to Germany, 1890). It is estimated that the existing British colonies and dependencies embrace about one sixth of the land surface of the globe and nearly the same proportion of its population.

According to their government relations with the crown the colonies are arranged under three heads: 1, Crown colonies, in which the crown has the entire control of legislation, while the administration is carried on by public officers under the control of the home government. 2, Colonies possessing representative institutions but not responsible government, in which the crown has no more than a veto on legislation, but the home government retains the control of public officers. 3, Colonies possessing representative institutions and responsible government, in which the crown has only a veto on legislation, and the home government has no control over any officer except the governor. All colonies are, however, disabled from such acts of independent sovereignty as the initiative in war, alliances, and diplomacy generally.

France was somewhat late in establishing colonies. Between 1627 and 1636 the West Indian islands of St. Christopher's, Guadeloupe, and Martinique were colonized by private persons. Champlain was the pioneer of the French in the exploration of the North American continent, and founded Quebec in 1608. Colbert purchased several West India Islands, as Martinique, Guadeloupe, St. Lucia, etc., and sent out colonists in 1664 to Cayenne. In 1670 the East India Company formed by Colbert founded Pondicherry, which became the capital of extensive possessions in the East Indies. At the beginning of the eighteenth century France had extensive settlements in Canada, Nova Scotia, and Newfoundland, the most flourishing of the West India Islands, and she seemed to have a prosperous career before her in India. Ere long, however, the rival interests of British and French colonists brought about a conflict which terminated in the loss of Canada and other North American possessions, as well as many of the West India Islands, while the dominion of India passed into the hands of the British. The chief colonial possessions of France at present are: in India, Pondicherry, and a few other small territories; Cochin-China, Tonquin, and the protectorates of Anam and Cambodia in Southeastern Asia; New Caledonia, the Loyalty and Marquesas Islands, etc., in Oceania; in Africa, Algeria, Tunis, Senegambia, island of Réunion, the protectorate of Madagascar, etc.; in America, Martinique, Gnadeloupe, St. Bartholomew, and Guyana. Algeria is now officially a French department.

Of recent years *Germany* has made an effort to take rank as a colonial power, and has acquired in Africa the territories of Damaraland and Luderitzland to the northward of Cape Colony, the Cameroons District, a considerable portion of territory formerly claimed by the sultan of Zanzibar, the Kilima-Njaro, the greater part of Somaliland, etc.; also in the Pacific a portion of New Guinea, now called Kaiser Wilhelm's Land, and the Bismarck Archipelago. *Denmark's* northern dependencies, Iceland, Greenland, and the Faroe Islands, though of considerable extent are of small value. In the West India Islands she has St. Thomas, settled in 1672; Santa Cruz, purchased from France in 1733; St. John; and some smaller islands.

Col'ophon, an ancient Ionian city of Asia Minor about 8 mi. n. of Ephesus, one of the places that claimed to be the birthplace of Homer, and the native city of Mimnermus, the elegiac poet, and of other eminent men.

Colorado (kol-o-rä'dō), one of the U. S. of America, situated in the central belt of states in the Rocky Mountains, and containing an area of 104,500 sq. mi. It is traversed from north to south by the main range of the Rocky Mountains, and forms a part of the region designated upon the early maps of the U. S. as the "Great American Desert." The plains east of the mountains constitute about one third of the total area. Among the elevated ranges are four large, natural parks—the North, South, Middle, and San Luis—

which form distinct, picturesque, and beautiful features of the mountain system, and are watered by numerous streams and covered with verdure. The San Luis park, situated in the southwestern division, is the only one of the series that is well adapted to agriculture, and the only one which has been peopled to any considerable extent. It is traversed from north to south by the Rio Grande River, has six towns, a mixed population of Americans and Mexicans, the whole numbering about 6,000. Sixteen thousand sq. mi. are covered by forests, chiefly yellow and white pine and spruce. None of the harder woods, except a few clusters of scrub oaks, worthless for anything but fuel, exist in Colorado. Four fifths of the state has an elevation of 4,000 to 10,000 ft. above the sea. The lowest on the eastern border is 3,703 ft., and on the western, 4,435. The mountain parks are 8,000 to 9,500 ft. above tide water. The summit of the main range averages 11,000 ft. Seventy-two peaks from which the snow never disappears, rise to heights between 13,500 and 14,500 ft. The loftiest of these is the Sierra Blanca, a part of the chain enclosing the San Luis park, 14,483 ft. high. The geographical center of Colorado is at a point 3 mi. n.n.e. of Spinney Station, on the Colorado Midland Railway, in Park county. The principal rivers on the eastern slope of the great mountains are the South Platte and the Arkansas; on the western, the Grand and the Gunnison, each re-enforced by innumerable tributaries from the melting snows. None are navigable. Here and there are beautiful fresh-water lakes, swarming with fish.

Climate.—The climate of Colorado is remarkably heathful. The air is dry, clear, and well adapted to the cure of diseases of the lungs and throat, The annual range of temperature is much less than in other sections of the country. In the various parts it is about 60° F. and the highest temperature does not exceed 80° nor the lowest 20° below. Health resorts are numerous in the mountain regions and there are also mineral and thermal springs. The mean temperature at Denver is 50°.

Vegetation.—The soil is fruitful and the climate is well adapted to the growth of cereals. The state is almost a treeless region, although there are a few trees in the river bottoms; these are cottonwood, box elder, scrub oak, pine, and spruce. The sides of the mountain up to the snow line are covered with pines of various kinds, spruce, and fir. These woods furnish the supply of lumber needed. There is a large supply of native grass in Colorado and this furnishes pasture for the large herds of cattle and sheep. Vegetables of all kinds and many fruits are successfully grown. The soil of the greater part of the state is very fruitful where it can have sufficient moisture. Irrigation is used to a great extent, and in such regions wheat, maize, barley, oats, hay, and potatoes are staple products. The proverbial "Colorado potato bug" has proved very destructive to many crops. Cattle and sheep raising are important industries. The value of the crops in 1899 was, corn, $1,251,940; wheat, $4,182,535; oats, $1,028,515.

Colorado

Minerals.—The chief industry of the state is mining, and in its yield of gold and silver it is the leading state of the Union. Nearly every known mineral is found within the state. There are thousands of mines which produce lodes of silver and gold. There are also large deposits of lead ores, and the state produces about 45 per cent. of the entire lead output of the whole country. One mine has been known to yield since its discovery about $160,000,000. Since 1880 Colorado has produced about $480,000,000 of gold and silver. One of the richest gold fields in the world has recently been opened up in the Cripple Creek district. In various parts of the state are iron mines of a good quality. There are large supplies of copper, zinc, cement, silica, gypsum, onyx, and several valuable clays. There are many veins of anthracite and bituminous coal and nearly every town and city in the state has coal within close range.

Manufactures.—In manufacturing Colorado ranks as the 28th state of the Union, producing annually about $70,000,000 worth of goods of various kinds. At the present time there are about 700 manufacturing establishments employing about 22,000 hands. The principal manufacturing industries are in connection with the mineral products of the state; they are brass works, lead works, machine shops, foundries, iron works, building materials, tin, copper works, flouring mills, and furniture.

Railroads.—There are at present about 4,500 mi. of railroads. The first railroad was built in 1870 extending n. from Denver 106 mi. and connecting with the Union Pacific at Cheyenne. Six trunk lines reach Denver from the Missouri River, and another extends from Denver to Fort Worth, Texas, forming a connection with lines to Galveston and New Orleans. The principal system is that of the Denver & Rio Grande which extends to Santa Fé, N. M., having lateral branches extending to all the important towns in the southern, southwestern, and western divisions of the state. There are also connecting lines between Denver and Salt Lake City.

Education.—Colorado has a state university, agricultural college, school of mines, state normal school, all of which are sustained by legislative appropriations. Other institutions of learning are Colorado College, University of Denver, Westminster University of Colorado, Presbyterian College of the Southwest, Longmont College, St. John's College, Jesuit College, etc. Since the admission of the state into the Union, over $15,000,000 has been expended in the extension of the common school system. There are thirty public libraries in the state, with about 65,000 volumes.

History.—About half of the present state of Colorado was acquired from France in the Louisiana purchase; the remainder was obtained from Mexico under the Treaty of Guadalupe Hidalgo. It was organized as a territory in 1861 and became a state in 1876, and is commonly known as the *Centennial State.* The

principal towns and cities are Denver, Aspen, Colorado Springs, Leadville, and Pueblo. Woman suffrage was adopted in the election of 1893 by a majority of over 4,000 votes. The new capitol building was completed in 1894 at a cost of $2,250,000. In 1890 the population According to the census of 1900 the total population of the state was 539,700, an increase since 1890 of 30.9 per cent. In population Colorado ranks as the thirty-first state in the Union.

Governors.—John L. Routt, 1876–79; Frederick W. Pitkin, 1879–83; James B. Grant, 1883–85; B. H. Eaton, 1885–87; Alva Adams, 1887–89; J. A. Cooper, 1889–91; J. L. Routt, 1891–93; D. H. Waite, 1893–95; A. W. McIntire, 1895–97; A. Adams, 1897–99; C. S. Thomas, 1899–1901; J. B. Orman, 1901–1903.

Colorado, a name of two rivers of the U. S. —1. The Western Colorado, (or Rio Colorado), formed by the junction of the Green and Grand rivers, in Utah. It flows s.w. and s. through Arizona, and between Arizona and Nevada and California, and after a total course, including Green River, of about 1,200 mi. falls into the Gulf of California. Among the most wonderful natural objects in North America is the Big Cañon of the Colorado. Here the river flows between walls of rock which are nearly vertical, and are in some places 6,000 ft. high. This cañon is more than 300 mi. long. 2, A river in Texas which rises in the n.w. part of the state, flows generally s.e., and after a course of about 900 mi. falls into the Gulf of Mexico at the town of Matagordo.

Colorado, Mitchell co., Tex., on Colorado River, 230 mi. w. of Fort Worth. Railroads: Texas & Pacific; and Colorado Valley. Industries: salt works, wool scouring mills, ice plant, and rolling works. Surrounding country agricultural and grazing. The town was first settled in 1876 and became a city in 1882. Pop. 1900, 2,019.

Colorado Beetle, an American species of beetle, nearly half an inch in length, almost oval, of a yellowish color marked with black spots and blotches, and on the elytra with ten black longitudinal stripes. The wings are of a blood-red color. It works great havoc among the potato crops.

Colorado Springs, El Paso co., Colo., 75 mi. s. of Denver. Railroads: D. & R. G.; C. R. I. & P.; Denver & Gulf; A. T. & S. F.; and Colorado Midland. It is a popular health resort and situated only ten miles from Pike's Peak. Colorado College is located there. The town was first settled in 1871. Population 1900, 21,085.

Collos'sæ, an ancient city of Asia Minor, in Phrygia, on the Lycus, a branch of the Mæander. It was the seat of one of the early churches of Asia to whom the apostle Paul wrote about 62 or 63 A. D.

Colosse'um, a name given to the Flavian Amphitheater in Rome, a large edifice for gladiatorial combats, fights of wild beasts, and similar sports. It was begun by Vespasian, and finished by Titus 80 A. D. The outline of the Colosseum is elliptic, the exterior length of the building being 620 and its breadth 513 ft.; it is pierced with eighty openings or vomitaria in the ground story, over which are superimposed three other stories, the whole rising perpendicularly to the height of 160 ft. Although two thirds of the original building have disappeared it is still a wonderful structure.

Colos'sus, in sculpture, a statue of enormous magnitude. The Asiatics, the Egyptians, and in particular the Greeks, have excelled in these works. The most celebrated Egyptian colossus was the vocal statue of Memnon, in the plain of Thebes, supposed to be identical with the most northerly of two existing colossi (60 ft. high) on the west bank of the Nile. Among the colossi of Greece the most celebrated was the colossus of Rhodes, a brass statue of Apollo 70 cubits high, esteemed one of the wonders of the world, erected at the port of Rhodes by Chares, 290 or 288 B. C. It was thrown down by an earthquake about 224 B. C. The statue was in ruins for nearly nine centuries, when the Saracens, taking Rhodes, sold the metal, weighing 720,900 lbs., to a Jew, about 653. There is no authority for the popularly-received statement that it bestrode the harbor mouth, and that the Rhodian vessels could pass under its legs. Among the colossi of Phidias were the *Olympian Zeus* and the *Athena of the Parthenon;* the former 60 ft. high and the latter 40. The most famous of the Roman colossi were the *Jupiter of the Capitol*, the *Apollo of the Palatine Library*, and the statue of Nero, 112 or 120 ft. high, and from which the contiguous amphitheater derived its name of *Colosseum.* Recently rock-cut statues have been measured at Bamian on the road between Cabul and Balkh, the largest being 173 ft. high and the second 120 ft.

Among modern works of this nature is the colossus of *San Carlo Borromete;* at Arona, in the Milanese territory, 60 ft. in height; the *Bavaria* at Munich, 65 ft. high; the statue of Hermann or Arminius near Detmold, erected in 1875, 90 ft. in height to the point of the upraised sword, which itself is 24 ft. in length; the height of the figure to the point of the helmet being 55 ft.; the statue of Germania, erected in 1883 near Rüdesheim, a figure 34 ft. high, placed on an elaborately-sculptured pedestal over 81 ft. high; and Bartholdi's statue of *Liberty* presented to the U. S. by the French nation, and which measures 104 ft., or to the extremity of the torch in the hand of the figure 138 ft. It is erected at New York harbor on a pedestal 114 ft., is constructed for a lighthouse with one of the most powerful fixed lights in the world, and stands 317 ft. above mean tide.

Color is the name given to distinguish the various sensations that lights of various rates of vibration give to the eye. As is the case with many of the words that denote our sensations, the word *color* is also applied to the properties of bodies that cause them to emit the light that thus affects our senses. The molecular constitution of a body determines

the character and number of the light vibrations it returns to the eye, and so gives to each body its own characteristic color; hence the term color is used to denote that in respect of which bodies have a different appearance to the eye independently of their form.

Ordinary white light (the light which comes from an incandescent solid or liquid) when transmitted through triangular prisms of glass or other media differing in dispersive power from the atmosphere, is shown to consist of a number of colored lights, which, meeting the eye, together produce the sensation of white light. The colors thus shown are usually said to be seven—red, orange, yellow, green, blue, indigo, violet; although in reality there is an enormous, if not an infinite number of perfectly distinct colors in light. The seven colors are frequently called the primary colors, and other tints and shades are producible by mixing them; but in a stricter sense the primary colors are three in number, namely, red, green, and violet (or blue). These three colors or kinds of light cannot be resolved into any others. In the scientific sense of the word white and black are not considered colors, a white body reflecting and a black body absorbing all the rays of light without separating them, whereas the colors proper are due to separation of the rays of light by partial absorption and reflection or by refraction. If a body absorbs every other kind of light and reflects or transmits red light only, it will appear of a red color; if it absorbs every kind except blue rays, it will appear blue; and so on. If more than one kind of light be transmitted or reflected the object will appear of a color compounded of these different rays of light.

In art the term color is applied to that combination or modification of tints which produces a particular and desired effect in painting. The colors of the spectrum have to be distinguished from color used in reference to *pigments*. The pigments red, blue, and yellow, regarded in the arts as the primary colors, produce effects when mixed, very different from those produced by admixture of the corresponding spectrum colors. These three pigment colors form other colors thus: red and yellow make orange, yellow and blue make green, and red and blue make purple; but red, blue, and yellow cannot be produced by any combination of the other colors. *Local colors* are those which are natural to a particular object in a picture, and by which it is distinguished from other objects. *Neutral colors*, those in which the hue is broken by partaking of the reflected colors of the objects which surround them. *Positive colors*, those which are unbroken by such accidents as affect neutral objects. *Complementary colors*, colors which together make white; thus any of the primary colors is complementary to the other two. *Subjective* or *accidental colors*, the imaginary complementary colors seen after fixing the eye for a short time on a bright-colored object, and then turning it suddenly to a white or light-colored surface.

Color Printing, the art of producing pictures, designs, cards, etc., in various colors by means of lithography, printing from metal blocks, etc. The ordinary methods are: 1, The chromo-lithographic, in which a tracing of the original picture, or the like, is first made, and a copy transferred to as many stones as there are colors in the original, every color requiring a fresh stone. The drawing on each stone is made to fit in, or *register*, with the preceding one, and as the paper passes through the machine an additional color is added every time, and thus the picture is built up color upon color (each being allowed to dry before the next is put on) until it is completed. Some chromos or oleographs may have as many as 25 or 30 printings or colors. 2, Block or surface color printing is specially adapted for book illustrations or similar work where nicety of detail or rapidity of production is required. As in chromo-lithography various printings are necessary; but these, while producing similar effects, are reduced in number by a method of printing several tints of the same color at one operation. Each block, which is usually of zinc and prepared in the usual way, is capable of producing three or more gradations of the same color; the darkest shade from the normal surface, lighter shades being got from parts which have been bitten or corroded in an almost imperceptible degree—the deeper corrosions giving, of course, the lightest shade. When all the tints of one color are thus printed from one block and in one operation, a second block with gradations, in the same way, is used, registering as in chromo-lithography, and so on until the picture is finished.

Coltsfoot, a weed of the order Compositæ, the leaves of which were once much employed as a remedy for asthma and coughs. The name is given from the leaf somewhat resembling the foot of a colt, being broad and heart-shaped; the flowers are yellow.

Col′uber, a genus of non-venomous serpents, which includes several North American snakes. To the same family belongs the common ringed snake, which attains a length of 3 or 4 ft.

Colum′ba, St. (521–597), a native of Ireland. In 545 he founded the monastery of Derry. About 563 he landed in the island of Hy, now called Iona, and founded his church. About 565 he went on a mission of conversion among the northern Picts, and traversed the whole of Northern Scotland preaching. Shortly before his death he revisited Ireland.

Columbia, District of, a portion of the U. S. containing the national capital, is bounded on the w. by the Potomac River and on all other sides by Maryland. It contains the cities of Washington and Georgetown, both under one government. The seat of government was moved here from Philadelphia in 1800, and in 1814, the Capitol, White House, and executive buildings were burned by the British. The control of the government of the district is in charge of three commissioners appointed by the president. These have power to make appointments to all offices in the cities and district. Among institutions of note outside the

capital are, the Soldiers' Home, the Columbia Institute for the Deaf and Dumb, and the government hospital for the insane. Pop. in 1900, 278,718. See *Washington.*

Columbia, Richland co., S. C., 130 mi. n.w. of Charleston on the Congagree River; the state capital. Railroads: Junc. Rich. & Danv., and others. Seat of the University of South Carolina, the Ursuline Institute (Catholic), a state insane asylum, etc. Center of a rich agricultural and forest district. Pop. 1900, 21,108.

Columbia, Lancaster co., Pa., on Susquehanna River, 12 mi. w. of Lancaster. Railroads: P. R. R.; Reading & Columbia; Columbia & Port Deposit, Frederick div. Industries: silk mills, several iron foundries, flour mill, iron mills, stove works, and lace mills. Surrounding country mineral and agricultural. The town was first settled in 1726 and is still a borough. Pop. 1900, 12,316.

Columbia, Maury co., Tenn., on Duck River, 45 mi. s. of Nashville. Railroads: N. C. & St. L.; L. & N.. and N. F. & Sheffield. Industries: cotton mills, two flouring mills, three lumber and planing mills, and a pump factory. Surrounding country is agricultural and mineral, and is in the blue grass region of Tenn. The town was first settled in 1807. Pop. 1900, 6,052.

Columbia College, a distinguished educational institution in New York, established in 1746, and giving a course of instruction in literature, divinity, science, medicine, law, and mining.

Columbia River (or Oregon), a river of the U. S. flowing into the Pacific Ocean, and rising at the base of the Rocky Mountains in British Columbia. It has a very winding course partly in British Columbia but mainly in the U. S., where it receives two large tributaries, Clark's River and Snake River. Latterly it turns abruptly to the west and forms the boundary between Washington and Oregon. It drains an area of 298,000 sq. mi., and has a length of about 1,400 mi.

Columbian Exposition, created by act of Congress of April 25, 1890, providing for celebrating the 400th anniversary of the discovery of America by Columbus. See *World's Columbian Exposition.*

Col'umbine, the popular name of plants with five colored sepals and five spurred petals. The common columbine is a favorite garden flower, and owes its name to the fancied resemblance of the petals to the form of pigeons.

Columbus, Muscogee co., Ga., on left bank of Chattahoochee River, 100 mi. s.s.w. of Atlanta. Railroads: Central of Georgia; Georgia Midland & Gulf; and Southwestern. Principal industries are large cotton mills, iron works, plow, barrel, and bagging factories, and many smaller industries. The export trade in cotton is very large. Surrounding country agricultural. Pop. 1900, 17,614.

Columbus, Lowndes co., Miss., on Tombigbee River. Railroads: M. & O.; and the Southern Ry. Industries: cotton mills, flouring mills, iron foundry, manufacture of agricultural implements, and many small factories. Large quantities of coal in vicinity. Surrounding country agricultural and mineral. Pop. 1900, 6,484.

Columbus, Bartholomew co., Ind., on e. fork of White River, 41 mi. s. by e. of Indianapolis. Railroads: Jefferson, Madison & Indianapolis; C. C. C. & St. L.; P. C. & St. L. Principal industries: tanneries, lumber mills, woolen and starch works, furniture factories, and agricultural implements. Population in 1900, 8,130.

Columbus, Franklin co., O., on Scioto River, 120 mi. n.e. of Cincinnati. Railroads: B. & O.; P. C. & St. L.; C. St. L. & P.; and eight others. It has a large inland trade in grain, wool, live stock, iron and coal, and important manufactures, principally iron and steel products, agricultural implements, and carriages. Lumber, leather, edge tools, and plows are also largely produced. It has a magnificent state capitol, State University of Ohio, Capital University, Ohio Agricultural and Mechanical College, and institutions for the blind, deaf, and dumb, and a large state penitentiary. Pop. 1900, 125,560.

Columbus, Christopher (1436–1506), the discoverer of America, was b. in Genoese territory. He was carefully educated and early in life developed a taste for geographical knowledge. In 1470 he married the daughter of Palestrello, a navigator. About this time he formed the opinion that undiscovered land lay west of Spain, and that it belonged to the continent of Asia. Aug. 3, 1492, by the aid of Isabella, queen of Spain, he was enabled to start on a voyage in search of a shorter route to India than the one around Africa. October 12 he landed on the island of Guanahani and named it San Salvador. He reached Cuba October 28, and Hayti December 6. Jan. 4, 1493 he returned to Spain. He made a second and third voyage, discovering a number of islands, and the main land of South America. Hoping to find the passage to India through Darien, he undertook a fourth voyage, May 9, 1502. In this expedition he was accompanied by his brother Bartolommeo and his son Hernando. He encountered every imaginable disaster from storms and shipwreck, and returned to Spain, sick and exhausted, in 1504. After two years of illness, humiliations, and despondency, he d. at Valladolid. His remains were transported, according to his will, to the city of St. Domingo, but on the cession of Hispaniola to the French they were removed in January, 1796, to the cathedral of Havana in Cuba.

Col'umn, in architecture, a round pillar, a cylindrical solid body set upright and primarily intended to support some superincumbent weight. A column has as its most essential portion a long solid body, called a *shaft*, set vertically on a *stylobate*, or on a congèries of moldings which forms its *base*, the shaft being surmounted by a more or less bulky mass which forms its *capital*. In classical architecture columns have commonly to support an *entablature* consisting of three divisions, the *archi-*

trave, frieze, and *cornice,* adorned with moldings, etc. Columns are distinguished by the names of the styles of architecture to which they belong; thus there are Hindu, Egyptian, Grecian, Roman, and Gothic columns. In classic architecture they are further distinguished by the name of the order to which they belong, as Doric, Ionic, Corinthian, Composite, or Tuscan columns. They may also be characterized by some peculiarity of position, of construction, of form, or of ornament, as attached, twisted, cabled, etc., columns. Columns are chiefly used in the construction or adornment of buildings. They have also been used, however, singly for various purposes, especially for monuments.

Comanches (kō-man′chēz), an American Indian tribe formerly roaming through Texas and part of Mexico. They were excellent horsemen, and extremely warlike, but their numbers are now insignificant. Some of them have been collected on a reservation in the western part of the Indian Territory.

Comayagua (kō-mȧ-vä′guȧ), a town of Central America, in Honduras, the capital of department of the same name, situated on the southern border of the plateau of Comayagua, about midway between the two oceans; a poor place. Pop. 6,240.

Comb, an instrument with teeth, made of tortoise shell, ivory, horn, wood, bone, metal, or other material, used for dressing the hair, and by women for keeping the hair in its place when dressed. Combs have been used from the earliest times by rude as well as by civilized races.

Combaco′num, a town of Hindustan, presidency of Madras, district of Tanjore. It was the ancient capital of the Chola dynasty, and is one of the most ancient and sacred towns in the presidency. It has a great many well endowed Hindu temples, a government college, courts, etc. Pop. 50,098.

Combustion, the operation of fire on inflammable substances, or the union of an inflammable substance with oxygen or some other supporter of combustion, attended with heat and in most instances with light. In consequence of the combination of the carbon in fuel with the oxygen of the air being the universal method of getting heat and light, and as when the action takes place the fuel is said to burn or undergo combustion, the latter term has been extended to those cases in which other bodies than carbon—for example, phosphorus, sulphur, metals, etc.—burn in the air or in other substances than air—for example, chlorine. Though the action between the gas and the more solid material, as coal, wood, charcoal, of whose combination combustion is the result, is mutual, the one having as much to do with the process as the other, yet the former, as oxygen, chlorine, iodine, and the compounds which they form with each other and with nitrogen, have received the name of supporters of combustion, while to the latter the term combustibles has been assigned.

Spontaneous Combustion is the ignition of a body by the internal development of heat

without the application of fire. It not unfrequently takes place among heaps of rags, wool, and cotton when lubricated with oil; hay and straw when damp or moistened with water; and coal in the bunkers of vessels. In the first case the oil rapidly combines with the oxygen of the air, this being accompanied with great heat; in the second case the heat is produced by a kind of fermentation; in the third by the pyrites of the coal rapidly absorbing and combining with the oxygen of the air. The term is also applied to the extraordinary alleged phenomenon of the human body being reduced to ashes without the direct application of fire. It is said to have occurred in the aged and persons that were fat and hard drinkers; but most chemists reject the theory altogether, maintaining that none of the instances adduced are well authenticated.

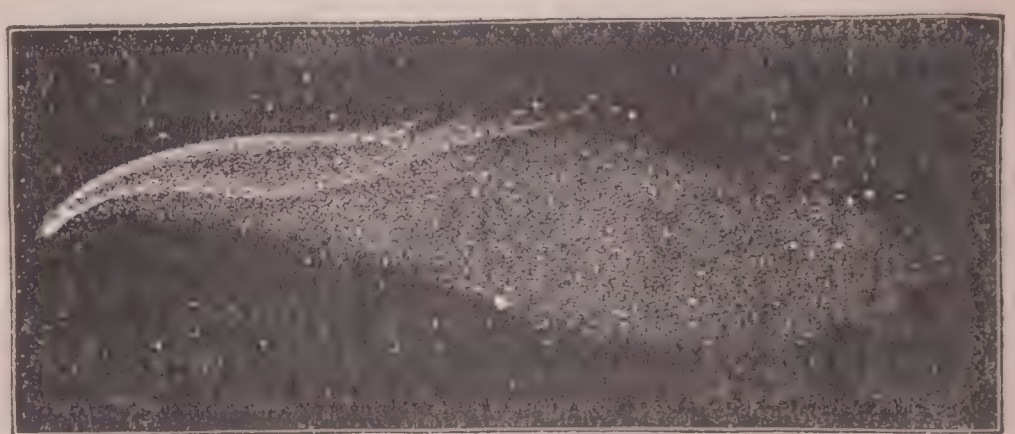
Com′ets, certain celestial bodies which appear at irregular intervals, moving through the heavens in paths which seem to correspond with parabolic curves, or in a few instances in elliptical orbits of great eccentricity. The former, after being visible from the earth for a shorter or longer time, disappear into space apparently never to return; the latter return to us periodically. Some comets are only visible by the aid of the telescope, while others can be seen by the naked eye. In the latter case they usually appear like stars accompanied with a train of light, sometimes short and sometimes extending over half the sky, mostly single and more or less curved, but sometimes forked. In a comet which appeared in 1744 the train was divided into several branches, spreading out from the head like a fan. The train is not stationary relatively to the head, but is subject to remarkable movements. The direction in which it points is always opposite to the sun, and as the comet passes its perihelion the train changes its apparent position with extraordinary velocity. The head of the comet is itself of different degrees of luminosity, there being usually a central core, called the *nucleus,* of greater brilliancy than the surrounding envelope, called the coma.

Comets were long regarded as supernatural objects, and usually as portents of impending calamity. Tycho Brahe was the first who expressed a rational opinion on the subject, coming to the conclusion that the comet of 1577 was a heavenly body at a greater distance from the earth than that of the moon. The general law of the motion of the bodies, as well as his own observations on the comet of 1680, led Newton to conclude that the orbits of the comets must, like those of the planets, be ellipses, having the sun in one focus, but far more eccentric; and having their *aphelions,* or greater distances from the sun, far remote in the regions of space. This idea was taken up by Halley, who collated the observations which had been made of all the twenty-four comets of which notice had been taken previous to 1680. The results were very interesting. With but few exceptions the comets had passed within less than the earth's shortest distance from the sun, some of them within less than

Comets

one third of it, and the average about one half. Out of the number, too, nearly two thirds had had their motions retrograde, or moved in the opposite direction to the planets. While Halley was engaged on these comparisons and deductions the comet of 1682 made its appearance, and he found that there was a wonderful resemblance between it and three other comets that he found recorded—the comets of 1456, of 1531, and of 1607. The times of the appearance of the comets had been at very nearly regular intervals, the average period being between seventy-five and seventy-six years. Their distances from the sun, when nearest to that luminary, had been nearly the same, being nearly six tenths of that of the earth, and not varying more than one sixtieth from each other. The inclination of their orbits to that of the earth had also been nearly the same, and their motions had all been retrograde. Putting these facts together Halley concluded the comets of 1456, 1531, 1607, and 1682 were reappearances of one and the same comet, which revolved in an elliptic orbit round the sun, performing its circuit in a period varying from a little more than seventy-six years to a little less than seventy-five; or having, as far as the observations had been carried, a variation of about fifteen months in the absolute duration of its year, measured according to that of the earth. For this variation in the time of its revolution Halley accounted upon the supposition that the form of its orbit had been altered by the attraction of the remote planets Jupiter and Saturn as it passed near to them; and thence he concluded that the period of its next appearance would be lengthened, but that it would certainly reappear in 1758 or early in 1759. As the time of its expected reappearance approached, Clairaut calculated that it would be retarded 100 days by the attraction of Saturn, and 518 by that of Jupiter, so that it would not come to the perihelion, or point of its orbit nearest the sun till April 13, 1759. It actually reached its perihelion on March 13, 1759, being thirty days earlier than had been calculated. Along the period of this comet and its perihelion distance the magnitude and form of its path were also calculated. Estimating the mean distance of the earth from the sun at 95,000,000 mi. (the number which was at that time considered the true one), the mean distance of the comet was calculated to be 1,705,250,000 mi.; its greatest distance from the sun, 3,355,400,000; its least distance 55,100,000; and the transverse or largest diameter of its orbit, 3,410,500,000. This comet, therefore, is a body belonging to the solar system, and quite beyond the attraction of any body which does not belong to that system. In 1835 it again returned, being first seen at Rome, August 5, and from that time continued to be observed till the end of the year in Europe, and through a great part of spring 1836 in the southern hemisphere.

The comet denominated *Encke's comet*, which has made repeated appearances, and first observed in 1818, and was identified with a comet observed in 1786, also with a comet discovered in 1795 by Miss Herschel in the constellation Cygnus, and with another seen in 1805. Its orbit is an ellipse of comparatively small dimensions, wholly within the orbit of Jupiter; its period is 1,260 days, or about $3\frac{3}{10}$ years. It has been frequently observed since. Another comet, the history of which is of the utmost importance in the latest theories regarding the connection of these bodies and the periodic showers of shooting stars, is one known as Biela's comet, discovered in 1826. It revolves about the sun in about $6\frac{3}{4}$ years, and was identified as the same comet which was observed in 1772 and in 1806. Its returns were noted in 1832, 1839, and 1845. In 1846 it divided into two, returned double in 1852, but has not since been seen, the supposition being that it has been dissipated, and that it was represented by a great shower of meteors that were seen in November, 1872.



Donati's Comet, 1858.

One of the most remarkable comets of recent times was that known as Donati's, discovered by Dr. Donati of Florence in 1858. The paths in which comets move are not, like those of planets, all nearly in the same plane as the orbit of the earth, but are inclined to that orbit at all angles. The orbits of the comets are at all possible angles; and the number increases with the angle, so that they approximate to an equal distribution in all directions round the sun as a center. A modern theory of the nature of comets is that these bodies were ejected millions of years ago from the interior of suns, or planets in a sunlike state. When a comet is viewed through a telescope of considerable power, there appears a dense nucleus in the center of the luminous and apparently vaporous matter of which the external parts are composed; and the opacity of this nucleus varies in different comets. On its first appearance, and again when it recedes, the luminous part of the comet is faint and does not extend far from the nucleus; but as it moves on toward the perihelion the brightness increases, and the luminous matter lengthens into a train, which, in some cases, has extended across a fourth of the entire circumference of the heavens. The most remarkable discovery of recent times regarding comets is the identity of the course of some of them with the orbit of certain showers of shooting stars. This was

first demonstrated by the Italian astronomer Schiaparelli, who proved the agreement between the orbit of the great comet of 1862 and that of the star shower seen annually about August 9, 10. It has since been demonstrated that every meteoric stream follows in the trail of some comet large or small, which either exists now or has been dissipated, as Biela's comet was, leaving only its meteoric train to show where it once traveled; and that every comet is followed or preceded by a train of meteors, extending over a greater or less portion of the comet's orbit according to the length of time during which the comet has existed.

Comma, in punctuation, the point [,] denoting the shortest pause in reading, and separating a sentence into divisions or members according to the construction. In music, a comma is the smallest enharmonic interval, being the difference between a major and a minor tone, and expressed by the ratio 80:81.

Commentry (kom-män-trē), a town of France, dep. of Allier, 8 mi. s.e. of Montluçon, in the midst of a vast coal field, to which the town owes its prosperity. Pop. 12,416.

Commerce, Chamber of, a board chosen from among the merchants and traders of a city to protect the interests of commerce; to lay before the legislature the views of their members on matters affecting commerce; to furnish statistics as to the staple trade of the locality; and to attain by combination advantages which could not be reached by private enterprise, etc. These associations originated in France early in the eighteenth century. A system of international chambers of commerce for promoting relations with foreign countries has been largely adopted. Nearly all large cities in the U. S. have chambers of commerce. Some are incorporated.

Commercial Law, the law which regulates commercial affairs among the merchants of different countries, or among merchants generally. It is derived from the different maritime codes of mediæval Europe, the imperial code of Rome, international law, and the custom of merchants. In this country the term is applied to that system of laws which refers to mercantile contracts, and is based upon the custom of merchants. The principal subjects embraced within it are the laws of shipping, including that of marine insurance; the law of negotiable bills of exchange and promissory notes; and the law of sales.

Commercial Treaties, treaties entered into between two countries for the purpose of improving and extending their commercial relations; each country engaging to abolish or to reduce to an agreed rate or otherwise modify the duties on articles of production and manufacture imported from the one country into the other. They are usually for a limited period but may be renewed and modified according to altering conditions. In the treaties the phrase, "most favored nation," implies concessions equal to the most favorable granted under any similar treaty.

Commines (ko-mēn), Philippe de (1445–1509), French writer and statesman. His *Memoires*, published in 1523, were valuable as contributions to the history of his times.

Committee of Public Safety, a body elected by the French Convention (April 6, 1793) from among its own members, at first having very limited powers conferred upon it—that of supervising the executive and of accelerating its actions. Subsequently, however, its powers became extended; all the executive authority passed into its hands, and the ministers became merely its scribes.

Common Council, the council of a city or a corporate town, empowered to make by-laws for the government of its citizens. The common councils sometimes consist of two houses, chambers or courts, and sometimes form only one. In our American cities the city council is generally composed of two branches, called respectively, select and common. They are elected by the people.

Common Law, the unwritten law, the law that receives its binding force from immemorial usage and universal reception, in distinction from the written or statute law; sometimes from the civil or canon law: and occasionally from the *lex mercatoria*, or commercial and maritime jurisprudence. It consists of that body of rules, principles, and customs which have been received from former times, and by which courts have been guided in their judicial decisions. The evidence of this law is to be found in the reports of those decisions and the records of the courts. Some of these rules may have originated in edicts or statutes which are now lost, or in the terms and conditions of particular grants or charters; but it is quite certain that many of them originated in judicial decisions founded on natural justice and equity, or on local customs. It is contrasted with, 1, the statute law contained in acts of Congress; 2, equity, which is also an accretion of judicial decisions, but formed by a new tribunal, which first appeared when the common law had reached its full growth; and 3, the civil law inherited by modern Europe from the Roman Empire. Wherever statute law, however, runs counter to common law, the latter is entirely overruled; but common law, on the other hand, asserts its pre-eminence where equity is opposed to it.

Common Pleas, in law, pleas brought by private persons against private persons, or by the government, when the cause of action is of a civil nature. In many states of the U. S. a court having jurisdiction generally in civil actions. In England the Court of Common Pleas is now merged in the High Court of Justice.

Commons, House of. See *Parliament.*

Common Sense, the philosophy of the so-called Scotch school of philosophy founded by Thos. Reid (1710–96), who aimed to establish a series of fundamental truths indisputable as primitive facts of consciousness. He taught that the general consent of mankind as to the existence of an external world, as to the difference between substance and qualities, between thought and the mind that thinks, is sufficient

to establish the reality of a permanent world apart from ourselves; and he maintains that sensations are not the objects of our perception, but signs which introduce us to the knowledge of real objects.

Commune, a small territorial district in France, being one of the subordinate divisions into which that country is parceled out; the name is also given to similar divisions in some other countries, as Belgium. In the country a commune sometimes embraces a number of villages, while some large cities are divided into a number of communes. In either case each commune is governed by an officer called a mayor.

Commune of Paris.—1, A revolutionary committee which took the place of the municipality of Paris in the French Revolution of 1789, and soon usurped the supreme authority in the state. Among its chiefs were some of the most violent of the demagogues, such as Hébert, Danton, and Robespierre. 2, The name adopted by the ultra-radical party in Paris brought once more into prominence by the events of the Franco-German War, more immediately by the siege of Paris (October, 1870, to January, 1871). They ruled over Paris for a brief period after the evacuation of the German troops, and had to be suppressed by troops collected by the National Assembly of France. The rising was entirely political and confined to Paris; it was based on no well-defined dogmas, only a fractional part of the communal government being communists in the economic sense, and these were soon thrust aside by their more violent and unscrupulous comrades.

Com'munism, the economic system, or theory, which upholds the absorption of all proprietary rights in a common interest, an equitable division of labor, and the formation of a common fund for the supply of all the wants of the community: the doctrine of a community of property, or the negation of individual rights in property. No communistic society has as yet been successful. Robert Owen made several experiments in modified communism, but they failed. St. Simon, Fourier, and Proudhon, have been the chief exponents of the system in France; and under the names of socialism, nihilism, etc., it seems to be working as a great, unseen force in several countries.

Como, capital of the province of Como, in the north of Italy (Lombardy), 24 mi. n.n.w. of Milan, in a delightful valley at the s.w. extremity of Lake Como. It has a splendid marble cathedral dating from the fourteenth century, the old church of S. Fedele of the tenth century, the townhall finished in 1215, the fine theater built in 1813. Here were born Pliny the elder and younger, and Volta, the natural philosopher. Pop. 25,560. The province of Como has an area of 1,049 sq. mi., and a pop. of 515,134.

Como, a lake in the north of Italy, at the foot of the Alps, fed and drained by the river Adda. It is celebrated for the beautiful scenery of its shores, which are covered with handsome villas, gardens, and vineyards, mountains raising behind to the height of 7,000 ft. Trout and other fish abound in the lake.

Comorin', a cape forming the south extremity of Hindustan, and consisting of a low, sandy point.

Com'oro Islands, a volcanic group in the Indian Ocean, between the northern extremity of Madagascar and the continent of Africa. They are four in number; Great Comoro, Mohilla, Johanna, and Mayotta. Area 758 sq. mi.; pop. 62,500.

Compass, an instrument used to indicate the magnetic meridian or the position of objects with respect to that meridian, and employed especially on ships, and by surveyors and travelers. Its origin is unknown, but it is supposed to have been brought from China to Europe about the middle of the thirteenth century. As now generally used it consists of three parts; namely, the box, the card or fly, and the needle—the latter being the really essential part, and consisting of a small magnet so suspended that it may be able to move freely in a horizontal direction. The box, which contains the card and needle, is, in the case of the common *mariner's compass,* a circular brass receptacle hung within a wooden one by two concentric rings called gimbals, so fixed by the cross centers to the box that the inner one, or compass-box, shall retain a horizontal position in all motions of the ship. The circular card is divided into thirty-two equal parts by lines drawn from the center to the circumference, called points or rhumbs; the intervals between the points are also divided into halves and quarters, and the whole circumference into equal parts or degrees, 360 of which complete the circle. The four principal are called cardinal points, viz., North, South, East, and West. The names of the rest are compounded of these. The needle is a small bar of magnetized steel. It is fixed on the under side of the card, and in the center is placed a conical socket, which is poised on an upright pointed pin fixed in the bottom of the box; so that the card, hanging on the pin, turns freely round its center, and one of the points, by the property of the needle, will always be directed toward the north pole. The needle, however, is liable to a certain deviation, owing to the magnetism of the ship itself, and this is especially strong in iron ships. To obviate this defect Sir W. Thomson has invented a compass having a number of needles arranged in a particular manner instead of one. In this compass quadrantal errors are corrected by means of two iron globes fixed on opposite sides of the binnacle; while the various components of the ship's magnetic force are neutralized by a series of bar magnets so arranged as to act as correctors. In the compass used by land surveyors and others the needle is not fixed to the card, but plays alone, the card being drawn on the bottom of the box.

Compasses (or pair of compasses), a mathematical instrument used for the describing of

circles, measuring lines, etc. They consist simply of two pointed legs, movable on a joint or pivot, and are used for measuring and transferring distances. For describing circles the lower end of one of the legs is removed and its place supplied by a holder for a pencil or pen. *Hair compasses* are compasses having a spring tending to keep the legs apart, and a finely threaded screw by which the spring can be compressed or relaxed with the utmost nicety, and the distance of the legs regulated to a hair's breadth. *Bow compasses* are compasses having the two legs united by a bow passing through one of them, the distance between the legs being adjusted by means of a screw and nut. *Proportional compasses* are compasses used for reducing or enlarging drawings, having the legs crossing so as to present a pair on each side of a common pivot. By means of a slit in the legs, and the movable pivot, the relative distances between the points at the respective ends may be adjusted at pleasure in the required proportion.

Compos'itæ, the largest known nat. order of plants, containing over 12,000 described species of herbs or shrubs distributed all over the world. The flowers are numerous and sessile, forming a close head on the dilated top of the receptacle, and surrounded by an involucre of whorled bracts. The flowers are monopetalous, and the order is divided into three natural groups from the form of the corolla: 1, *Tubuliflōræ*, in which it is tubular, with five, rarely four, teeth; 2, *Labiatifloræ*, in which it is divided into two lips; and 3, *Liguliflōræ*, in which it is slit or ligulate. The stamens are inserted on the corolla, and their anthers are united into a tube. The style is two-cleft at the apex. The fruit is dry and seed-like. The head of numerous florets was called by the older botanists a compound flower, hence the name.

Composite Order, in architecture the last of the five orders; so called because the capital belonging to it is composed out of those of the other orders, borrowing a quarter-round from the Tuscan and Doric, a row of leaves from the Corinthian, and volutes from the Ionic. Its cornice has simple modillions or dentils. It is called also the *Roman* or the *Italic* order.

Composition of Forces and Motions, in mechanics, the union or assemblage of several forces or motions that are oblique to one another, into an equivalent force or motion in another direction. Thus two forces acting in the directions of the adjacent sides of a parallelogram, compose one force acting in the direction of the diagonal, and if the lengths of the adjacent sides represent also the magnitudes of the forces, the diagonal will represent the magnitude of the compound force.

Compressed Air, atmospheric air compressed by means of pumps, etc. As a means of transmitting power, compressed or condensed air received the attention of scientists as early as 1700 A.D. In that year, Dr. Papin, of Blois, the first man to apply a piston in a steam cylinder, the inventor of the digester and the steelyard safety valve, employed com-

pressed air to drive a piston in a cylinder which was intended to drive a pump. He used a fall of water to compress the air in a cylinder. His experiments were not successful. About 100 years later, a Welsh engineer used the power derived from a heavy fall of water to work a blowing cylinder from which the air was conveyed to a blast furnace, a mile and a half distant, The blast, however, was too feeble to do much work. About 1840, an English patent for the application of compressed air to working cranes, hoisting machines, and other machinery was granted. The air was compressed by an air pump, or compressor, and was conducted through pipes to the machinery. Compressed air frequently is called a "power." This is a misnomer, for the prime mover is the steam engine, turbine, or other form of water wheel, which operates the pump or compressor which compresses the air. The elastic air under pressure transmits the power used in compressing it when it is permitted to expand in a suitable device which will respond to the pressure exerted. In practise, the air is compressed by a pump or compressor, which, in its simplest form, is a piston working in a cylinder. The air is sucked in through suitable valves, with one stroke of the cylinder, compressed with the next stroke, and thus forced into a reservoir from which the service pipes lead.

Another method of using compressed air has been developed by the improvements made in automobile or horseless carriages, and motors for hauling street cars. The air, under enormous pressure, is stored in steel bottle-shaped reservoirs made seamless from a solid ingot of steel. These bottles are made to sustain a pressure of 2,000 lbs. or more to the sq. in. When charged with the compressed air, they are coupled, singly or in series, with the auxiliary reservoir on the motors, and a suitable reducing valve permits the air to fill the auxiliary reservoir until the working pressure of from 10 to 100 lbs. is secured. In practise, a small fire of coal, coke, gasoline, or kerosene, is maintained to heat the air just before it is expanded into the working cylinder. The heat not only gives the compressed air added efficiency, due to the expansion caused by heat, but it also removes the objection due to the snow and ice formed by the suddenly released air. In compressing the air, heat is formed; in suddenly expanding the air, the heat is absorbed so rapidly that ice and snow are formed. This has been an objectionable feature in the use of compressed air for transmitting power.

Compressed air is used for operating the automatic brakes which now are part of the equipment of every passenger car, locomotive, mail car, baggage car, and sleeping car in the U. S., and over half a million freight cars. In a few years, every freight car, and in fact every car of whatever description that is used on a railroad in the U. S. must under the federal law, be equipped with automatic air brakes. Compressed air also is used to operate rock drills, air motors in manufac-

turing establishments, air hoists of every description, passenger and freight elevators, clocks, to lift water, acids, and other liquids, as an agitator in preparing asphaltum for street paving, to paint broad surfaces, bridges, freight cars, warehouses, and buildings, to force plastic material through dies, holes, and pipes, to operate motors for hauling street cars, mine cars, and cars on railroads, to operate motocycles, automobiles, and all forms of horseless vehicles, to inflate "pneumatic" tires for bicycles and carriages, to drive the sand in a sand blast; to clean carpets, rugs, cars, etc., and for hundreds of other purposes.

George Westinghouse, Jr. invented the automatic air brake, which is standard on American railroads. He first made what was known as the "straight air" system, in which the brakes were set by direct pressure from the main reservoir. But this system was not automatic, and the engineer never was sure that all the brakes were set. Any leaks in the service pipes or elsewhere lowered the efficiency of the brake. The vacuum system was directly opposite to the direct air system. In it an imperfect vacuum was maintained, and atmospheric pressure did the work. The development of the air brake led to the invention and adoption of the "automatic air brake" system. The principal features of this system are the air pump, installed on the locomotive just in front of the cab; the main reservoir in which the compressed air is stored; the engineer's valve in the engine cab by which all the operations of the air brake are controlled; the train pipe, or principal service pipe which supplies the auxiliary air reservoirs under each car with compressed air; the triple valve which serves to feed the compressed air into the auxiliary reservoirs, and to supply the brake cylinder with air. It is this triple valve which makes the system automatic.

The air pump stands in front of the locomotive cab. It is strong, compact, and has two cylinders; a steam cylinder which drives the piston of the air cylinder. A valve, regulated by the pressure of the air in the main reservoir, throttles the steam to the air pump when the requisite pressure of air is secured. The air, compressed by the air pump, is led through a pipe to the main storage tank which generally is placed between the steam cylinder just back of the pilot. From this air tank, a pipe leads to the engineer's valve in the engine cab, within easy reach of the engine driver. This valve is a three-way valve. The air, generally, is compressed to a pressure of 90 lbs. to the sq. in., in the main reservoir. A certain movement of the handle of the engineer's valve opens the ports which permit the air to pass into the train pipe which runs from the locomotive under each car. This pipe is connected between the cars by a rubber hose, so that it is continuous. The engineer permits about 70 lbs. pressure of air to fill the car reservoirs through the train pipe. The air passes through the triple valve, which is so constructed that when the pressure of air in the car reservoir is the same as that in the train pipe, the valve is balanced, and will respond to a decrease or increase of pressure from one side or the other. In this balanced, or normal condition, there is no connection between the car reservoir and the air brake cylinder. But when the engineer wishes to apply the brakes, he throws the handle of the engineer's valve to a certain position. That opens a port which permits the air in the train pipe to escape into the open air. This lowers the pressure in the train pipe, and the balanced valve, responding to the higher pressure in the car reservoir, slides back, and thus opens an aperture which permits the air in the car reservoir to reach the brake cylinder. The pressure of the air forces the piston of the brake cylinder forward, and this piston, through suitable levers, presses the brake shoes against the wheels and the brakes are set. Within the brake cylinder is a coiled spring. When the engineer desires to release the brakes, he feeds air from the main reservoir on the locomotive into the train pipe, thus increasing the pressure. This forces the balanced valve the other way, and thus opens an aperture which releases the air in the brake cylinder into the open air. The coiled spring reacting, forces the brake piston back to its normal condition, and thus releases the brakes.

A compressed air motor for hauling street cars is simply a reservoir in which compressed air is stored, and a driving mechanism, which in all its essential parts, is almost identical with a steam locomotive; that is, it has cylinders with pistons which are connected with the driving wheels. The air is compressed at a central station, and stored in a large tank. A pipe connection is made with the storage tank of the motor, and the tank is charged with air from the central reservoir. In practise, the air from the storage tank on the motor passes through a pipe to the working cylinders, and this pipe passes through water which is heated by a fire to 300° or more, and maintained at that temperature. This, it is estimated, gives an added efficiency of at least 5 per cent. to the compressed air and also prevents the valves and working gear from clogging because of the ice and snow which would form from cold air. Sometimes the reservoir on the motor is simply a cylindrical tank. But the later improvements make the reservoir a group or bundle of steel bottles, which are capable of withstanding pressures of 2,000 lbs. or more to the sq. in. A reducing valve lowers this storage pressure to a working pressure of from 50 to 150 lbs. Compressed air motors can be reversed, as steam locomotives are, and suitable valves permit the motorman to apply storage pressure direct to the working cylinders if necessary. At this time (1897) compressed air as a motive power is an experiment, although in several cities of the U. S. and Europe there are compressed air motors in daily operation. It is claimed that by heating the air before it enters the working cylinders, an efficiency of 92 per cent. is secured against 70 per cent. when not heated. Within a few years, the use of compressed air in lifting water has worked a revo-

lution in water-works practises. It has come rapidly into use because of its simplicity as a means of raising water from deep wells, and because it increases the yield of wells that have begun to decrease in capacity. The conspicuous feature of the "air lift," as it is called, is that it takes all the water a well can supply, whereas a mechanical pump, it is estimated, sometimes gives less than 20 per cent. of the capacity of the well. A pipe for the compressed air is let down into a well, and forces the water up through another pipe which either encloses the compressed air pipe or is another pipe altogether. A system or group of wells can be operated from a central plant, where the air is compressed and led to the wells.

Rock drills are working cylinders mounted on tripods, the pistons of the cylinders have drills fastened to the end, and the air drives the pistons up and down, causing the drills to do work. A number of drills are supplied with air through pipes which lead back to the main air reservoir. The first work of any moment done by compressed air was in 1861, driving the Mont Cenis tunnel. The first successful application of compressed air to rock drills in America was made by Walter Shanly, in driving the Hoosac tunnel, 1868–1874. It was in that tunnel that nitroglycerine was first introduced in the U. S. The largest compressed-air plant in America is at Quinnsec Falls, in Michigan, on the Menominee River. The initial power is derived from the falls, which are 47 ft. in height. The plant consists of three pairs of Rand compressors, 32 in. diameter by 60 in. stroke, and one pair 36 in. diameter and 60 in. stroke, delivering 3,000 horse power through 3½ mi. of pipe to the Chapin and Ludington iron mines at Iron Mountain for pumping, hoisting, and motive power engines above ground, and direct acting pumps and rock drills below ground. The power is carried through a 24 in. pipe with a loss of only one pound in pressure, with a working efficiency of 75 per cent. Data secured from contractors on the main drainage channel of the sanitary district of Chicago in excavating the drainage canal, shows that the cost of drilling with steam was 8.64 cents per cubic yard of rock; with compressed air, 6.30 cents per cubic yard of rock. Compressed air is coming into use in boiler shops, machine shops, foundries, railroad shops, etc. In the Topeka shops of the Atchison, Topeka & Santa Fé Railroad Co., five miles of air pipe are used in the shops and around the grounds. Some idea of the saving in labor secured by the use of compressed air in railroad shops can be found in the following illustrations: the stay bolt cutter will do the work of fifteen men; rotary grinder saves the work of six men; rotary saw, for sawing car roofs, saves the work of four men; pneumatic hammer saves the work of three men; pneumatic painting machine, one man does the work of ten painting by hand; device for cleaning coaches saves the work of ten men.

Following are some of the uses to which compressed air is put in railroad shops: elevating sand at engine house, elevating oil at oil house, hoisting heavy castings and tools, forcing couplings on air hose, operating cylinder boring bar, operating valve facing machine, filling cylinders of hydraulic presses, removing and applying driving tires, testing water pumps after repairs, drilling, tapping, and reaming with motors, cleaning boilers and machinery, punching jacket rivet holes, taking old paint off tin roofs, chipping, cutting, and caulking, operating letter presses, jacking up cars and trucks, cleaning interior of cars and upholstered work, burning paint off coaches, painting cars, etc.

Compressed air is used on the vessels of the U. S. navy for the following purposes: to operate main engine auxiliaries, auxiliary, fire, bilge, and water service pumps, steering engine, boat cranes, turret-turning engines, hydraulic cylinders for working guns, ammunition hoists, ash hydro-pneumatic hoists, feed pumps, smoke hose for guns, whistle and siren, to send messages about the ship through pneumatic tubes, to clear a compartment of water when filled, to ventilate, heat, and cool the ship, and to operate the engine of the ordinary working launch. Compressed air also is used in dynamite guns.

Com'stock Lode, a large and extremely rich metallic lode in the western part of Nevada, on the eastern slope of the Virginia Mountains. To it belong the Big Bonanza and other mines, which have yielded gold and silver to the value of over $300,000,000.

Comte (Kont), Auguste (1798–1857), founder of the "positive" system of philosophy. He was educated at the Ecole Polytechnique, and embraced enthusiastically the socialist tenets of St. Simon. He was employed, in 1820, to draw up a formula of the doctrines professed by the St. Simonian school. This work did not, however, meet with the approbation of St. Simon. In 1826 Comte commenced a course of lectures on positive philosophy, but only four lectures were given when he became deranged in mind, and did not recover till the end of 1827. In 1830 he commenced the publication of his *Cours de Philosophie Positive*, which was completed in 1842, and was translated into English and condensed by Harriet Martineau. As a practical faith his system is now stationary, though as a philosophy of knowledge it is widely accepted.

Co'mus, in the later Greek mythology, the god of revelry, feasting, and nocturnal entertainments, generally represented as a drunken youth.

Concan, a maritime subdivision of Hindustan, in the presidency of Bombay. It includes the town and island of Bombay. Area about 13,639 sq. mi.; pop. about 537,983.

Concentra'tion, in chemistry, the act of increasing the strength of solutions. This is effected in different ways: by evaporating off the solvent, as is done in the separation of salt from sea water; by distilling off the more volatile liquid, as in the rectification of spirit of wine; by the use of low temperatures, as in the

purification of benzol; by difference of fusibility, as in Pattison's process for desilvering lead.

Concepcion', a seaport of Chile, capital of a province of the same name, on the right bank of the Biobo, 7½ mi. from its mouth, a well-built town, with a cathedral. Its port at Talcahuano, a small town on the Bay of Concepcion, about 8 mi. distant, is one of the best in Chile. Concepcion was founded in 1550, and has suffered much from earthquakes and attacks by the Araucanians. Pop. 25,120.

Concerti'na, a musical instrument invented by Professor Wheatstone, the principle of which is similar to that of the accordion. It is composed of a bellows, with two faces or ends, generally polygonal in shape, on which are placed the various stops or studs, by the action of which air is admitted to the free metallic reeds which produce the sounds.

Conch (kongk), a marine shell, especially a large spiral shell of a trumpet shape, and which may be blown as a trumpet, as is the practise in Hindustan and some of the Pacific Islands.

Conchifera (kon-kif'ẽ-rā), Lamarck's name for that large class of acephalous mollusks which have shells consisting of two pieces, commonly known as oyster, mussel, etc.

Conchol'ogy, the science of shells, that department of zoology which treats of the nature, formation, and classification of the shells with which the bodies of many mollusca are protected; or the word may be used also to include a knowledge of the animals themselves, in which case it is equivalent to *malacology*. In systems of conchology shells are usually divided into three orders, Univalves, Bivalves, and Multivalves, according to the number of pieces of which they are composed.

Con'cord, in music, the combination of two or more sounds pleasing to the ear. Concords are the octave, the fifth, third, and sixth. The first two are called *perfect*, because as concords they are not liable to any alteration by sharps or flats. The two last are called *imperfect*, as being alterable.

Concord, a town of Massachusetts, near the Concord River, 18 mi. n.w. of Boston. Here at Concord Bridge, April 19, 1775, the first shots of the American Revolution were fired and a monument on the bank of the river marks where two English soldiers fell. It is famous as the home of Ralph Waldo Emerson, Hawthorne, Thoreau, and Alcott. Pop. 5,652.

Concord, the capital of the state of New Hampshire, on the Merrimac River 59 mi n.w. of Boston. It was once called Rumford and here Benjamin Thompson, afterward Count Rumford, resided. It is one of the largest railway centers in New England. It has manufactures of carriages, hardware, cutlery, woolen fabrics, paper, etc. Pop. 1900, 19,632.

Con'crete, a composition used in building, consisting of hydraulic or other mortar mixed with gravel or stone chippings about the size of a nut. It is used extensively in building under water, for example, to form the bottom of a canal or sluice, or the foundation of any structures raised in the sea; and it is also frequently used to make a bed for asphalt pavements, or to form foundations for buildings of any kind. It is sometimes even used as the material with which the walls of houses are built, the concrete being firmly rammed into molds of the requisite shape, and then allowed to set.

Concre'tions, Morbid, in animal economy, hard substances that occasionally make their appearance in different parts of the body, as well in the solids as in those cavities destined to contain fluids. They are usually named according to the parts of the body in which they occur. Their composition is equally various, but the most common constituents are phosphates, urates, or other salts, in combination with mucus, albumen, fibrin, and other organic matter.

Condé (kōn-dē), town and fortress of France, dep. Nord, at the confluence of the Hayne and Scheldt. It gave their title to the Condé family. Pop. 3,382.

Condé, Louis de Bourbon, Prince of (the *Great Condé*) (1621–1687), a famous general. In 1641 he married a niece of Cardinal Richelieu. His defeat of the Spanish at Rocroi, in 1643, was followed, in 1645, by his defeat of Mercy at Nordlingen, and by his capture of Dunkirk in 1646, the year in which he inherited his father's title. During the troubles of the Fronde he at first took the side of the court; but believing himself to be ill requited by Mazarin, he put himself at the head of the faction of the *Petits Maîtres*, and was imprisoned for a year by Mazarin (1650). On his release he at once put himself at the head of a new Fronde, entered upon negotiations with Spain, and, his attack of Paris being indecisive, retired to the Netherlands, where he was appointed generalissimo of the Spanish armies. In this capacity he unsuccessfully besieged Arras in 1654; but he was more fortunate at Valenciennes in 1656, and at Cambrai in 1657. In 1658 he was defeated before Dunkirk by Turenne, but was restored to his rank in France after the peace of 1659. In 1668 he accomplished the reduction of Franche Comté in three weeks; and in 1674 he defeated the Prince of Orange at Senef. His successes over Montecuculi in Alsace in 1675 closed his military career. Four years after he retired to Chantilly, near Paris, and d. at Fontainebleau.

Condé, Louis Joseph de Bourbon, Prince of (1736–1818), b. at Chantilly; only son of the Duke of Bourbon and the Princess of Hesse-Rheinfels. He distinguished himself in the Seven Years' War.

Condensed Milk. See *Milk*.

Con'denser, a syringe by which air is compressed into a receiver. Also a vessel in which aqueous or other vapors are condensed by cooling into the liquid form.

Con'dor, a South American bird, one of the largest of the Vulturidæ or vulturine birds. In its essential features it resembles the common vultures, differing from them mainly in the large cartilaginous carbuncle which surmounts its beak, and in the large size of its

oval and longitudinal nostrils placed almost at the extremity of the cere. Despite the many stories of its gigantic proportions, Humboldt met with no specimens whose wings exceeded 9 ft. in expanse, though it has occasionally been known to attain an expanse of 14 ft. It is found in greatest numbers in the Andes chain, frequenting regions from 10,000 to 15,000 ft. above the level of the sea. They are generally to be seen in groups of three or four, and only descend to the plains under stress of hunger, when they will successfully attack sheep, goats, deer, and bullocks. They prefer carrion, however, and, when they have opportu-

Condor.

nity, gorge themselves until they become incapable of rising from the ground, and so become a prey to the Indians. The king vulture is another bird of the same genus.

Condorset (kon-dor-sā), Marie Jean Antoine Nicolas de Caritat, Marquis de (1743–1794), an eminent French writer. The merit of his work gained for him in 1769 a seat in the Academy of Sciences, of which, after the publication of his *Eloges des Académiciens morts avant 1699* (1773), he was appointed perpetual secretary (1777). In 1777 his *Theory of Comets* gained the prize offered by the Academy of Berlin; he enriched the *Transactions* of many learned societies, and took an active part in the *Encyclopédie.*

Condottieri (kon-dot-tē-ā′rē), an Italian name given to the captains of those bands of mercenary soldiers who, in the fourteenth and fifteenth centuries, hired themselves out to carry on the petty wars of the Italian states. Montreal d'Albarno, a gentleman of Provence, was the first to give definite organization to a lawless band of this kind, and many of them attained a considerable size and power. For the most part these mercenaries were good soldiers and splendidly equipped, but rapacious and cruel to all but their own class.

Con′ductor (or Lightning Conductor), an instrument by means of which either the elec-

tricity of the clouds, the cause of lightning, is conducted without explosion into the earth, or the lightning itself is received and conducted quietly into the earth or water without injuring buildings, ships, etc. It was invented by Benjamin Franklin about 1752, and met with speedy general adoption. It usually consists of a stout iron rod with one or more points at the top, the lower end being metallically connected with thick strips of copper which are carried into the ground to a considerable depth and terminated, if possible, in water or in wet earth.

Cone, as used in geometry, generally means a right circular cone, which may be defined as the solid figure traced out when a right-angled triangle is made to revolve round one of the sides that contain the right angle.

Cone, in botany, a dry compound fruit, consisting of many open scales, each with two seeds at the base, as in the conifers; a strobilus.

Coney Island, a popular resort situated at the southwestern end of Long Island, in New York. It is historical as the place of Henry Hudson's landing in 1609. All parts of the island are reached by railroad lines from New York City, Jersey City, and Brooklyn. It was annexed to Brooklyn in 1894. During the summer months it is crowded with pleasure-seeking humanity from many parts of the country.

Confederation of the Rhine, the league of Germanic states formed by Napoleon Bonaparte in 1806, and including Bavaria, Wurtemberg, Baden, Hesse-Darmstadt, the kingdom of Westphalia, etc.

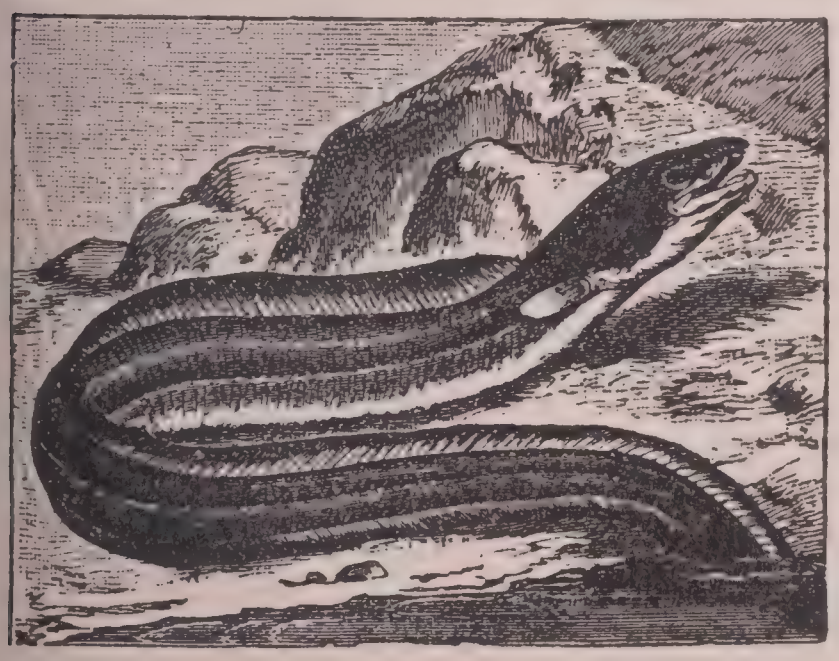
Confidential Communication, in law a communication made by one person to another which the latter cannot be compelled to give in evidence as a witness. Generally all communications made between a client and his agent, between the agent and the counsel in a suit, or between the several parties to a suit, are treated as confidential. The privilege of confidentiality does not extend to disclosures made to a medical adviser, and in England it has been decided also that confessions made to a priest are not to be treated as confidential.

Confisca′tion, the act of condemning as forfeited, and adjudging to the public treasury, the goods of a criminal in part punishment of a crime.

Confu′cius (or Kong-fu-tse), that is, "the teacher, Kong" (B.C. 550–478), the famous Chinese sage; b. in the province of Shantung, then belonging in part to the small vassal kingdom of Lu. His father, Shuh-liang-heih, who was of royal descent, d. three years later, and the boy was reared in comparative poverty by his mother, Ching-tsai. At the age of seventeen he was made inspector of corn markets; at nineteen he married, and after about four years of domesticity, in which a son and two daughters were borne him, he commenced his career as a teacher. In 517 B.C. he was induced by two members of one of the principal houses in Lu, who had joined his band of disciples, to visit the capital with them, where he had interviews with Lao-tze, the founder of

Taouism. Though temporarily driven from Lu to Tsi by a revolution, he soon returned thither with an increased following, and at the age of fifty-two was made chief magistrate of the city of Chung-too. So striking a reformation was effected by him that he was chosen for higher posts, became minister of crime, and with the aid of two powerful disciples elevated the state of Lu to a leading position in the kingdom. Its marquis, however, soon after gave himself up to debauchery, and Confucius became a wanderer in many states for thirteen years. In 483 he returned to Lu, but would not take office. The deaths of his favorite disciples Yen Hwin and Tze-lu in 481 and 478 did much to further his own, which took place in the latter year. Confucius left no work detailing his moral and social system, but the five canonical books of Confucianism are the *Yih-king*, the *Shu-king*, the *Shi-king*, the *Le-king*, and the *Chun-tsien*, with which are grouped the "Four Books," by disciples of Confucius, the *Ta-hëo* or *Great Study*, the *Chung-Yung* or *Invariable Mean*, the *Tun-yu* or *Philosophical Dialogues*, and the *Hi-tse* written by Meng-tse or Mencius. The teaching of Confucius has had, and still has, an immense influence in China, though he can hardly be said to have founded either a religion or a philosophy. All his teaching was devoted to practical morality and to the duties of man in this world in relation to his fellow men; in it was summed up the wisdom acquired by his own insight and experience, and that derived from the teaching of the sages of antiquity.

Conger Eel (kong′gėr), a genus of marine eels characterized by a long dorsal fin beginning near the nape of the neck, immediately above the origin of the pectoral fins, and having the upper jaw longer than the lower. It is pale-



Conger Eel.

brown above, grayish-white below, with whitish dorsal and anal fins fringed with black. Its flesh is eaten, but is somewhat coarse.

Conglom′erate, a term applied by geologists to rocks consisting mostly of water-worn pebbles cemented together by a matrix of siliceous, calcareous, or other cement, often called also *plum pudding stone.*

Congo (or Zaire), one of the great rivers of the world, in Southern Africa, having its embouchure in the South Atlantic. The mouth of the river was known to the Portuguese in 1485, but the lower part of its course was first explored by an English expedition under Captain Tuckey in 1816, which ascended it for about 172 mi. In 1867, however, Livingstone discovered a considerable river called the Chambezi, rising in the Chibalé Hills, and having followed it to Lake Bangweolo traced it thence as the Luapula to Lake Moero, and thence again as the Lualaba to Nyangwe. From this point its exploration was taken up in 1876–77 by Stanley, who proved its identity with the Congo. It carries more water to the ocean than the Mississippi, its volume being next to that of the Amazon. Its total length is perhaps 3,000 mi. Its chief tributaries are the Aruwimi and the Mobangi from the right, and the Ikelemba and Kwa from the left, which latter represents the collected waters of immense rivers from the south, such as the Kassai, the Kwango, etc. It is navigable for about 110 mi. from its mouth, after which the navigation is interrupted by cataracts.

Congo Free State, a state recently founded on the river Congo, in Central South Africa, stretching by a kind of narrow neck of territory to the river's mouth, but expanding inland so as to cover an immense area, mainly lying south of the river. The obvious advantages of the Congo as a waterway in opening up the continent led to the formation at Brussels in 1878 of a Comité d Etudes du Haut Congo, under the patronage of Leopold II, having as its aim the internationalization and development of the Congo area. Under its auspices Stanley returned in 1879 (see preceding art.) to open up the river and form a free state under European auspices. He established a first station at Vivi, the limit of maritime navigation, 110 mi. above the mouth of the river, constructed roads past the Yellala and Livingstone cataracts, and hauled steamers up to the higher reaches of the Congo, where in 1882 the station of Leopoldville was formed on Stanley Pool. Of the 223 mi. between Vivi and Leopoldville only 88 are navigable water; but from the latter station to Stanley Falls the Congo itself is continuously navigable for 1,000 mi., to which its great affluents already explored add no fewer than 5,000 mi. of serviceable waterway. Above the Stanley Falls station (destroyed by Arab slave dealers in November, 1886) the river is again navigable for a distance of 385 mi. to Nyangwe, which is about 1,300 mi. from the Chambezi sources. The work having been thus initiated by Stanley, and the feasibility of the project made manifest, the association in 1884–85 entered into treaties with all the European powers and the U. S. for the recognition of its sovereign power. The boundaries of the new Congo Free State were settled at the same time, it being agreed that the basin of the Congo and its tributaries should be free to all nations, that no duties should be levied on imports, and that the slave trade should be suppressed. The central government is at

Brussels, consisting of the king of Belgium as sovereign, and three departmental chiefs. Arrangements are being made for the construction of a railway past the falls obstructing navigation. A number of stations have been formed on the river, the chief of which is Boma, about 70 mi. from its mouth. The revenue at present largely consists of a subsidy from King Leopold. The exports forming the staple of present trade are palm oil, caoutchouc, ivory, orchilla, copal, groundnuts, camwood, wax, etc. Area estimated at 1,000,000 sq. mi.; pop. 27,000,000.

Congress, an assembly of the delegated representatives of sovereign states, for the purpose of considering matters of international interest. Even in America, though the term has now a different meaning, it had a similar origin, the first congress being that of the delegates from the various British colonies, who met Oct. 7, 1765, for the purpose of considering their grievances. Previous to signing a treaty of peace, a meeting of plenipotentiaries usually takes place, to which the name of a congress is sometimes applied, though it seems more properly to be reserved for those more important meetings at which extensive schemes of future policy are determined on. To this class belonged the famous Congress of Vienna in 1815; that of Carlsbad in 1819, for regulating the affairs of Germany; that of Paris at the end of the Russian War of 1854–56; and that at Berlin after the Russo-Turkish War of 1877–78. The word congress is often used interchangeably with conference. For U. S. Congress, see *United States.*

Con′greve, WILLIAM (1670–1729), English dramatist. His plays belong to the artificial school of comedy, which aimed rather at the production of a sustained flow of wit than at the precise delineation of character.

Congreve, SIR WILLIAM (1772–1828), English inventor of the Congreve rocket. He invented the rocket about 1804. It was first used in active service in the attack on Boulogne, 1806, and on Copenhagen, 1807. He took out patents also for the manufacture of gunpowder and of banknote paper, and wrote treatises on the mounting of naval ordnance and on the hydropneumatic lock. He died at Toulouse.

Coni (or Cu′neo), a town of North Italy, capital of the province of Coni. Formerly all merchandise passing from the seaport of Nice to Lombardy, Switzerland, and Germany went by this route, but the railway has confined its trade to Turin and neighboring towns. It has manufactures of silks and woolens. Pop. 12,413.

Conic Sections, three curves, the hyperbola, the parabola, and the ellipse, so called because they are formed by the intersection of the surface of a cone with planes that cut the cone in various directions. If the cutting plane be parallel to the axis the curve formed is the hyperbola (1); if parallel to the slope of the cone the curve is a parabola (2); if passing through both sides of the cone obliquely the section is an ellipse (3). A section perpendicular to the axis of the cone forms a circle (4), which may also be considered one of the conic sections. A perpendicular plane through the apex gives a triangle (5).

Conif′eræ, the pines, firs, and their allies, a natural order of gymnospermous exogens, the essential character of which consists in the manner in which the ovules, not enclosed in an ovary, receive directly the action of the pollen without the intervention of a stigma. The ovules in these plants are borne on scales or modified leaves, which are spread out, not folded, and generally grouped in such a manner as to form a *cone* composed of a greater or smaller number of these leaves, of which only a portion may be fertile and bear ovules. The disposition of the ovules in relation to these scales permits of a division of the Coniferæ into three distinct families or tribes.

Conjev′eram, a town of Hindustan, presidency of Madras, district of Chingleput. It possesses two famous pagodas dedicated to Vishnu and Siva, and the inhabitants are mostly Brahmans. Cottons are manufactured in the town. Pop. 37,275.

Conjunc′tion, in astronomy, the position of two of the heavenly bodies, as two planets, or the sun and a planet, when they have the same longitude (are in the same direction from the earth). When it is simply said that a planet is *in conjunction,* conjunction with the sun is to be understood. *Superior* conjunction and *inferior* conjunction are terms used of the planets whose orbits are nearer to the sun than that of the earth, according as the sun is between us and them, or they between us and the sun.

Conkling, ROSCOE (1829–1888), American statesman, b. in Albany, N. Y. In 1850 he became district attorney for Oneida county, and was made mayor of Utica in 1858. The same year he was chosen as a Republican to Congress and was re-elected in 1860, was defeated in 1862, but was re-elected in 1864. His first important speech was in support of the fourteenth amendment to the Constitution. He was re-elected in 1866, and in January, 1867, took his seat in the U. S. Senate, and was re-elected in 1873 and in 1879. In 1881 he became hostile to President Garfield's administration on a question of patronage, claiming, with his colleague, Thomas C. Platt, the right to control federal appointments in his state. They finally resigned their seats in the Senate and appealed to the legislature of New York for a re-election as a vindication of their course, but they were unsuccessful, and Conkling resumed the practise of law in New York City. He declined the nomination of justice of the U. S. Supreme Court, offered by President Arthur, and practised law until his death.

Connaught (kon′nạt), the smallest of the four provinces of Ireland, situated between Leinster and the Atlantic; area 4,392,086 acres. It is divided into five counties—Galway, Mayo, Roscommon, Leitrim, and Sligo. Pop. 723,573.

Connecticut (kon-net′i-kut), a river, the west branch of which forms by treaty a part of the boundary between the U. S. and Canada. It rises on the north border of New Hampshire; forms the boundary between Vermont and New

Hampshire, passes through the west part of Massachusetts and the central part of Connecticut, and falls into Long Island Sound. It is navigable for vessels drawing from 8 to 10 ft. for about 300 mi. from its mouth, subsidiary canals, however, being required above Hartford; total length, 450 mi. It is famed for its shad fisheries.

Connecticut, one of the original thirteen states of the American Union; bounded by New York, Massachusetts, Rhode Island, and Long Island Sound; length, east to west, about 95 mi.; greatest breadth, north to south, about 72 mi.; area 4,990 sq. mi. The state lies on the south slope of the hilly regions of New England, with a general surface much diversified; there is, however, no land above 1,000 ft. in elevation. Besides the Connecticut, two other rivers flow from the north into Long Island Sound—the Housatonic and the Thames. The Connecticut is the largest river in New England, rising on the northern border of New Hampshire, 1,600 ft. above the sea, flowing s.s.w., separating Vermont and New Hampshire, crossing the western part of Massachusetts, and central part of Connecticut, flowing s.s.e. below Middletown, and emptying into the Sound at Saybrook. Its length is more than 450 mi., with a width in Connecticut varying from 500 to 1,000 ft. It is navigable to Middletown (30 mi.) for vessels drawing 10 ft., and to Hartford (50 mi.) for those drawing 8 ft. The eastern part of the state is drained by the Thames, which is formed by the Yantic and Shetucket. It is navigable to Norwich. In the western part of the state is the Housatonic. To this place it is navigable for small vessels. Besides these large streams there are very many smaller ones, affording, in their rapid descent from the hills, an immense amount of water power. There are several well-defined ranges of hills. Of these the Housatonic hills are the most westerly, and extend along that river to the coast. The Green Mountain range, running south from Vermont, terminates near New Haven. The Blue Hills of Southington are a part of the Mount Tom range of Massachusetts, and lie between the Green Mountain range and the Connecticut River. On the eastern side of the river is a fourth range which the river crosses at Chatham. The mineral wealth of the state is considerable. Copper is found in the Simsbury mines at Granby, and at Bristol. Iron ore is found in great quantities in Salisbury, Kent, Sharon, Cornwall, and Canaan, and has been worked for 125 years. Limestone and marble of the very best quality are found at Canaan, Washington, and Milford. At Portland and Cromwell are the well-known immense quarries of freestone largely in demand for building. The excellent slate flagging from Bolton and Haddam is abundant in supply and in great demand. Granite, gneiss, hydraulic lime, tiling slate, clay, and sulphate of baryta are found in great quantities. There are over 100 mi, of deeply indented coast on the Sound (which measures 140 mi. by 24 mi.), affording excellent harbors. The chief of these

Connecticut

are Stonington, New London, Saybrook, New Haven, Bridgeport, and Fairfield. The harbor at New London is one of the best in the country, capacious, and never frozen over.

Climate.—The climate of the state, while very changeable, is very healthful,—the mortality being below the average of the other states. There is scarcely any spring season, but summer opens abruptly about May, and the cold weather begins in November. The winters with their keen n.w. winds, are severe, but the dryness of the air makes some compensation. The mean temperature of the year is 48° F.

Vegetation.—Among the forest trees of Connecticut are pine, hemlock, white, yellow, and red oak, hickory, walnut, chestnut, butternut, tulip, beech, birch, ironwood, silver and red maple, ash, elm, sassafras, wild cherry, red cedar, juniper, and a few shrubs and small trees. Wild fruits are grapes, beech, and sloe plums, crab apples, blackberries, cranberries, strawberries, etc. Among the agricultural products are corn, wheat, oats, barley, buckwheat, potatoes, tobacco, hay, clover seed, and grass seed.

Minerals.—The state ranks fourth in the production of granite. Iron ore has been mined for over 160 years. There are considerable quantities of copper, lead, nickel, and cobalt. Limestone and marble of the best quality are quarried.

Manufactures.—In manufacturing, the state ranks tenth in the Union. Manufacturing forms the leading industry of the state, and is of a greater variety than in any other state. The principal industries are rubber goods, hardware, clocks, paper, firearms, carriages, cotton goods, woolen and silk fabrics, machinery, hosiery, furniture, sewing machines, saddlery, pianos, tools, buttons, and pins. Excellent water power is furnished by the numerous rivers.

Education.—The value of school property is estimated at about $6,000,000, which does not include several private schools. The institutions of higher learning are Yale University, founded in 1701; Trinity College; and Wesleyan University. There are 180 public libraries, with over 700,000 volumes. There is an agricultural college at Mansfield, established in 1881. The state institutions include the state prison, hospital for the insane, school for boys, blind asylum, two schools for deaf mutes, and a school for imbeciles.

History.—Connecticut was one of the original thirteen states and ratified the U. S. Constitution in 1788, being the fifth colony to do so. She took an active part in the War of 1812. The present constitution was adopted in 1818, doing away with slavery. During the Civil War the state took a very prominent part. The population in 1900 was 908,355, ranking twenty-ninth in the Union. The principal cities are Bridgeport, Danbury, Hartford (the capital), Meriden, New Britain, New Haven, Norwalk, Norwich, Stanford, and Waterbury.

Governors.—Matthew Griswold, 1784; Samuel Huntington, 1786; Oliver Wolcott, 1796; Jona-

than Trumbull, 1798; John Treadwell, 1809; Roger Griswold, 1811; John Cotton Smith, 1813; Oliver Wolcott, 1818; Gideon Jomlinson, 1827; John S. Peters, 1831; Henry W. Edwards, 1833; Samuel A. Foote, 1834; Henry W. Edwards, 1835; Wm. W. Ellsworth, 1838; Chauncey F. Cleveland, 1842; Roger S. Baldwin, 1844; Isaac Toucey, 1846; Clark Bissell, 1847; Joseph Trumbull, 1849; Thomas H. Seymour, 1850; C. H. Pond (acting), 1853; Henry Dutton, 1854; William T. Miner, 1855; Alexander H. Holley, 1857; Wm. A. Buckingham, 1858; Joseph R. Hawley, 1866; James E. English, 1867; Marshall Jewell, 1869; James E. English, 1870; Marshall Jewell, 1871; Chas. R. Ingersoll, 1873; R. D. Hubbard, 1877; C. B. Andrews, 1879; H. B Bigelow, 1881; T. M. Waller, 1883; H. B. Harrison, 1885; P. C. Lounsbury, 1887; M. G. Bulkeley, 1889; Luzon B. Morris, 1893; O. Vincent Coffin, 1895; L. A. Cooke, 1897; G. E. Lounsbury, 1899; G. P. McLean, 1901.

Connellsville, Fayette co., Pa., on Youghiogheny River, 54 mi. s.e. of Pittsburg. Railroads: B. & O.; P. & L. E. Industries: tin plate mill, lock and hardware factory, two machine and car shops, two fire brick works, railroad shops, planing mills and flour mill. Coal, coke, and natural gas in vicinity; the center of the Connellsville coke region. Surrounding country agricultural and mineral. The town was first settled in 1770 by Zachariah Connell and became a borough in 1806. Pop. 1900, 7,160.

Connersville, Fayette co., Ind., on west fork of White River, 67 mi. n.w. of Cincinnati. Railroads: White Water Valley; C. H. & D.; and Ft. W. C. & L. Industries: furniture factory, three flouring mills, three iron foundries, and two planing mills. The town was settled in 1788 and became a city in 1872. Pop. 1900, 6,836.

Co'non, an Athenian who had the command of a fleet in 413 B. C. to prevent the Corinthians from relieving Syracuse, then at war with Athens, and who, after various services, succeeded Alcibiades in 406.

Con'rad II, king of Germany and emperor of the Romans, reigned from 1024 to 1039, and is regarded as the true founder of the Franconian or Salic line.

Conrad III, king of Germany and emperor of the Romans from 1138 to 1152, was the founder of the Suabian dynasty of Hohenstaufen.

Consanguin'ity, the relation of persons descended from the same ancestor. It is either lineal or collateral—lineal between father and son, grandfather and grandson, and all persons in the direct line of ancestry and descent, from one another; collateral between brothers, cousins, and other kinsmen descended from a common ancestor, but not from one another.

Conscience, that power or faculty, or combination of faculties, which decides on the rightness and wrongness of actions; otherwise called the *Moral Sense.* Whewell defines it as "the reason, employed about questions of right and wrong, and accompanied with the sentiments of approbation and condemnation, which, by the nature of man, cling inextricably to his apprehension of right or wrong." See *Ethics.*

Conshohocken, Montgomery co., Pa., on Schuylkill River, 13 mi. n. of Philadelphia. Railroads: Phila. & Reading; and Pennsylvania. Industries: iron foundry, cotton mills, flouring mill, and factories for the manufacture of surgical instruments, tubes, and fences. Surrounding country agricultural. The town was first settled in 1682 and was incorporated as a borough in 1850. Pop.1900, 5,762.

Conserv'atives, in British politics, the party that substantially corresponds to what used to be the Tory party, taking the opposite side to the *Liberals.* The name came into use about the time of the passing of the Reform Act of 1832, and is often used as implying greater enlightenment or liberality than *Tory.*

Conserv'atory, a name given to a systematic school of musical instruction. Conservatories were originally benevolent establishments attached to hospitals, or other charitable or religious institutions. In Naples there were formerly three conservatories for boys; in Venice four for girls; the Neapolitan group being reduced in 1818 to a single establishment under the name Royal College of Music. In Milan a conservatory was established in 1808. In France the musical school established in connection with the Opera received its final organization in 1795 under the name of *Conservatoire de Musique.* The Conservatorium, founded at Leipsic in 1842 under the auspices of Mendelssohn, is perhaps the most influential in Germany. Institutions of the same description exist in Warsaw, Prague, Munich, Berlin, and Vienna, and in many American cities.

Conservatory, in gardening, a term generally applied by gardeners to plant houses, in which the plants are raised in a bed or border without the use of pots, the building being frequently attached to a mansion. The principles of their construction are in all respects the same as for the greenhouse, with the single difference that the plants are in the free soil, and grow from the floor instead of being in pots placed on shelves or stages. The distinction, however, is often overlooked.

Consign'ment, a mercantile term which means either the sending of goods to a factor or agent for sale, or the goods so sent. The term is chiefly used in relation to foreign trade. The receivers of consignments have usually to keep magazines and stores, for the use of which their consigners are charged. The profits of a consigning agency often compare favorably with the occasionally larger but much less safe profits of original ventures. The consigning trade is protected by special laws. In most countries a consigner can claim his goods and collect all outstanding debts for goods sold on his account by a consignee who has suspended payment.

Console.

Con′sole, in architecture, a projecting ornament or bracket having for its contour generally a curve of contrary flexure. It is employed to support a cornice, bust, vase, or the like, but is frequently used merely as an ornament.

Con′sonant, a letter so named as being sounded only in connection with a vowel, though some consonants have hardly any sound even when united with a vowel, serving merely to determine the manner of beginning or ending the vowel sounds; as in *ap, pa, at, ta.* In uttering a consonant there is greater or less contact of some parts of the organs of speech; in uttering a vowel there is a want of such contact, the vocal passage being open though variously modified.

Conspir′acy, in law, an offense ranked as a misdemeanor, and punishable by imprisonment and hard labor. It is constituted by a combination between several persons to carry into effect any purpose injurious either to individuals, particular classes, or the community at large. When the conspiracy leads to any overt act of an unlawful kind, the offense becomes felony.

Con′stable, Archibald (1774–1827), Scottish bookseller and publisher He was the original publisher of the *Edinburgh Review*, the poems of Sir Walter Scott, the *Waverly Novels*, the *Supplement to the Encyclopædia Britannica*, and other valuable works.

Constable, John (1776–1837), English landscape painter. In 1819 his *View on the River Stour* procured him admission as an associate of the Academy. From this period his reputation widely extended itself, both over Britain and the Continent. His careful studies of landscape in respect of tone were of great influence in art.

Con′stance, a town of Germany, in Baden. The town has various branches of industry and a considerable trade. It was once a flourishing imperial city with three times its present population. Pop. 16,235.

Constance, Lake of, a lake, Central Europe, forming a reservoir in the course of the Rhine; area 207 sq. mi.

Constan′tia, a small district in Cape Colony a few miles from Cape Town, celebrated for its wine, made from vines brought originally from Persia and the Rhine, esteemed the best liquor wine after Tokay, and owing its special properties largely to the soil.

Con′stantine, a town in Algeria, capital of a province of same name. Both within the town and in the vicinity Roman remains abound. The manufactures consist chiefly of woolen and linen goods; the trade is in corn, linen, and wax. Pop. 46,581.

Con′stantine, Caius Flavius Valerius Aurelius Claudius (274–337), Roman emperor, surnamed the *Great*, son of the Emperor

Constantine Chlorus. After the death of his father he was chosen emperor by the soldiery, in the year 306. In 325 Constantine became the sole head of the Roman Empire. His internal administration was marked by a wise spirit of reform. In 329 he laid the foundation of a new capital of the empire, at Byzantium, which was called after him Constantinople, and soon rivaled Rome herself. In 337 he was taken ill near Nicomedia, was baptized, and died after a reign of thirty-one years, leaving his empire between his three sons, Constantine, Constantius, and Constans.

Constantine, Paulovitch (1779–1831), grand-prince of Russia, second son of Paul I. He distinguished himself in 1799 under Suwarroff, and at Austerlitz in 1805; and in 1812, 1813, and 1814 attended his brother, the Emperor Alexander, in all his campaigns. He was afterward employed in superintending the affairs of the new kingdom of Poland, and was successively made military governor and generalissimo of the Polish troops. On the decease of his brother in 1825 he was proclaimed emperor at St. Petersburg, in his absence, but as he adhered to a previous renunciation of his claim to the throne, his younger brother, Nicholas, became Alexander's successor. He died, execrated by the Poles as one of their most barbarous oppressors.

Constantino′ple ("city of Constantine"), a celebrated city of Turkey in Europe, capital of the Turkish Empire, situated on a promontory jutting into the Sea of Marmora, having the Golden Horn, an inlet of the latter, on the n. and the Bosporus on the e. The city proper is thus surrounded by water on all sides except the w., where is an ancient and lofty double wall of four mi. in length, stretching across the promontory. On the opposite side of the Golden Horn are Galata, Pera, and other suburbs, while on the Asiatic side of the Bosporus entrance is Scutari. Occupying the extreme point of the promontory on which the city stands is the Seraglio or palace of the sultan, which, with its buildings, pavilions, gardens, and groves, includes a large space. At the principal entrance is a large and lofty gate, called Bab Humayum, "the high door" or "sublime porte," from which has been derived the well-known diplomatic phrase. Of the 300 mosques, the most remarkable are the royal mosques, of which there are about 15, esteemed the finest in the world. First among these is the mosque of St. Sophia, the most ancient existing Christian church, converted into a mosque in 1453 on the capture of the city by the Turks. Another magnificent mosque is that of Soliman; after which are those of the Sultana Valide, built by the mother of Mohammed IV, and of Sultan Achmet, the most conspicuous object in the city when viewed from the Sea of Marmora. The streets are mostly extremely narrow, dark, dirty, and ill paved, and exceedingly crooked and tortuous, but there has been a certain opening up and improvement in the last twenty years owing to the construction of tramways and the railway to Adrianople, which runs along

the shore of the Sea of Marmora and past the Seraglio to the entrance of the Golden Horn. The numerous covered and uncovered bazars are severally allotted to particular trades and merchandise. Constantinople has but one remarkable square, called the At-Meidan, occupying the site of the ancient *Hippodrome.* There are about 130 public baths in the city, mostly of marble, of plain exterior, but handsome and commodious within. The numerous cemeteries, mostly outside the western wall, have become vast forests, extending for miles round the city and its suburbs. The few manufactures are chiefly confined to articles in morocco leather, saddlery, tobacco pipes, fez caps, arms, perfumes, gold and silver embroideries, etc. The foreign commerce is considerable. The harbor, the Golden Horn, which more resembles a large river than a harbor, is deep, well sheltered, and capable of containing 1,200 large ships, which may load and unload alongside the quays. It is about 6 mi. long, and a little more than half a mile broad at the widest part. Among the imports are corn, timber, cotton stuffs, and other manufactured goods. The exports consist of silk, carpets, hides, wool, goats' hair, valonia, etc. The suburb Galata is the principal seat of foreign commerce. Here are situated the arsenals, the dock yard, the artillery barracks, etc., extending along the Bosporus for nearly 1½ mi. It is an ancient place. Pera occupies the more elevated portion of the promontory of which Galata forms the maritime part. Both it and Galata have now much of the appearance of a modern European town. Top Haneh is situate a little farther up the Bosporus than Galata, of which it forms a continuation. It has a government foundry and arsenal for cannon. Constantinople occupies the site of the ancient Byzantium, and was named after Constantine the Great, who rebuilt it about A.D. 330. It was taken in 1204 by the Crusaders, who retained it till 1261; and by the Turks under Mohammed II, May 29, 1453—an event which completed the extinction of the Byzantine Empire. Pop. 874,926.

Constella'tions are the groups into which astronomers have divided the fixed stars, and which have received names for the convenience of description and reference. It is plain that the union of several stars into a constellation, to which the name of some animal, person, or inanimate object is given, must be entirely arbitrary, since the several points (the stars) may be united in a hundred different ways, just as imagination directs. The grouping adopted by the Egyptians was accordingly modified by the Greeks, though they retained the Ram, the Bull, the Dog, etc.; and the Greek constellations were again modified by the Romans, and again by the Arabians. At various times, also, Christianity has endeavored to supplant the pagan system, the Venerable Bede having given the names of the twelve apostles to the signs of the zodiac, and Judas Schillerius having, in 1627, applied Scripture names to all the constellations. Weigelius, a professor of Jena, even grouped the stars upon a heraldic basis, introducing the arms of all the princes of Europe among the constellations. The old constellations have, however, been for the most part retained. Ptolemy enumerated forty-eight constellations, which are still called the *Ptolemæan.* The different stars of a constellation are marked by Greek letters, α denoting those of the first magnitude, β those of the second, and so on. Stars of the sixth magnitude are the smallest visible to the naked eye. Several stars have also particular names.

Constitu'tion, the fundamental law of a state, whether it be a written instrument of a certain date, or an aggregate of laws and usages which have been formed in the course of ages. The ideal constitution is that established by a free sovereign people for their own regulation, though the expediency of other forms at various stages of national development cannot but be recognized. The chief of these are: 1, Constitutions granted by the plenary power of absolute monarchs. 2, Those formed by contract between a ruler and his people, the contract being mutually binding. 3, Those formed by a compact between different sovereign powers.

In regard to political principles, constitutions are: 1, Democratic, when the fundamental law guarantees to every citizen equal rights, protection, and participation, direct or indirect, in the government, such as the constitutions of the U. S. and of some cantons of Switzerland. 2, Aristocratic, when the constitution recognizes privileged classes, as the nobility and clergy, and intrusts the government entirely to them, or allows them a very disproportionate share in it. Such a constitution was that of Venice, and such at one time those of some Swiss cantons, for instance, Bern. 3, Of a mixed character. To this latter division belong some monarchical constitutions, which recognize the existence of a king whose power is modified by other branches of government of a more or less popular cast.

Con'sul, a name originally given to the two highest magistrates in the republic of Rome. After King Tarquinius Superbus had been expelled by the joint efforts of the patricians and plebeians (509 B.C.), two consuls were placed at the head of the senate. These officers were annually elected, at first only from the patricians; at a later period also from the plebeians. In order to be eligible to the consulship, the candidate was to be forty-five years of age, and must have passed through the inferior offices of quæstor, ædile, and prætor, and he was required by law to be in Rome at the time of the election. All these laws, however, were disregarded at various junctures in Roman history. The insignia of the consuls were a staff of ivory with an eagle at its head, a toga bordered with purple, which under the emperors was embroidered; an ornamental chair, and twelve *lictors,* who, with *fasces* and axes, preceded them. In the beginning of the republic the authority of the consuls was almost as great as that of the preceding kings. They

could declare war, conclude peace, make alliances, and even order a citizen to be put to death; but their powers were gradually curtailed, especially by the establishment of the tribunes of the people, early in the fifth century. But they still stood at the head of the whole republic; all officers were under them, the tribunes of the people only excepted; they convoked the senate, proposed what they thought fit, and executed the laws. In times of emergency they received unlimited power, and could even sentence to death without trial, levy troops, and make war without the resolve of the people first obtained. Under the emperors the consular dignity sunk to a shadow, and became merely honorary. The last consul at Rome was Theodorus Paulinus (A.D. 536).

In France the name of *consul* was temporarily adopted for the chief magistrates after the revolution. The directorial government (third constitution) having been abolished by the revolution of the Eighteenth Brumaire, of the year VIII (Nov. 9, 1799), a provisional consular government, consisting of Bonaparte, Siéyès, and Roger Ducos, established the fourth constitution, proclaimed December 15, by which France was declared a republic under a government of *consuls.* Three elective consuls (Bonaparte, Cambacérès, Lebrun) had almost uncontrolled executive authority, while the legislative power was in the hands of the tribunate and the legislative assembly; a conservative senate was also elected. But as early as Aug. 2, 1802, Bonaparte was proclaimed first consul for life, and thus the constitution of France became again practically monarchical. On April 10, 1804, he was proclaimed emperor, and even the nominal consulate ended.

At present *consuls* are officials appointed by the government of one country to attend to its commercial interests in seaports or other towns of another country. The duties of a consul generally speaking are to promote the trade of the country he represents; to give advice and assistance when called upon to his fellow subjects; to uphold their lawful interests and privileges if any attempt be made to injure them; to transmit reports of trade to his own government, to authenticate certain documents, etc. They are generally of three ranks; *consuls, general consuls,* and *vice consuls.*

Consumption, in political economy, all use or expenditure of the products of industry or of things having an exchangeable value. It is usually characterized as productive or unproductive, according as it does or does not conduce to the efficiency of a producer and to further production. Thus wealth in the form of machinery is consumed productively by wear and tear in the processes of production; and, similarly, wealth expended in improving land is productively consumed; but the wealth expended in the maintenance of an operatic artist is, from the ordinary point of view, unproductively consumed. The classification, however, is not of a very definite kind, the distinction lying for the most part in the degree of directness and obviousness with which

the act of consumption is related to production. Hence in the case of the operatic artist it is sometimes urged that the recreative benefit conferred upon the community tends indirectly to increase efficiency in production, and that from this point of view the artist consumes productively. So the expenditure of wealth in war, or in preparations for war, usually classed as unproductive, may be really productive consumption, as tending to the assurance of the producer in the stability of the commercial conditions. The perfect characterization of an act of consumption as productive or unproductive involves the consideration of elements of a frequently incommensurable kind, and the rough, practical economic test has to be employed with some amount of reservation. Consumption is the end of all production: and as the demand of the consumer determines the employment of the various coefficients of production,—land, labor, and capital,—it is urged by many later economists that the scientific treatment of economics should proceed from consumption to production, instead of from production to consumption in accordance with the method of the older economists. Too much stress may be laid upon this method, but the consideration of economic problems from the standpoint of the consumer is of advantage, as giving the social need, rather than the producer's profit, the prior claim upon the attention.

Contempt', an offense against the dignity, order, or authority of a court or legislative assembly. Contempts committed out of court may be punished by fine or imprisonment; contempts done before court are usually punished by commitment or fine. The power of vindicating their authority against contempt is incident to all superior courts.

Content and **Noncontent** are the words by which assent and dissent are expressed in the House of Lords. Aye and No are used in the House of Commons.

Continent'al System, a plan devised by Napoleon to exclude Britain from all intercourse with the continent of Europe. It began with the decree of Berlin of Nov. 21, 1806, by which the British Islands were declared to be in a state of blockade; all commerce, intercourse, and correspondence were prohibited; every Briton found in France, or a country occupied by French troops, was declared a prisoner of war; all property belonging to Britons, fair prize, and all trade in goods from Britain, or British colonies entirely prohibited. Britain replied by orders in council prohibiting trade with French ports, and declaring all harbors of France and her allies subjected to the same restrictions as if they were closely blockaded. Further decrees on the part of France, of a still more stringent kind, declared all vessels of whatever flag, which had been searched by a British vessel or paid duty to Britain, denationalized, and directing the burning of all British goods, etc. These decrees caused great annoyance, and gave rise to much smuggling, till annulled at the fall of Napoleon, 1814.

Contour (kon'tör), an outline. In geodesy *contours*, or *contour lines*, are lines or levels carried along the surface of a country or district at a uniform height above the sea level, and then laid down on a map or plan, so that an approximately true outline of its contour is presented, the degree of accuracy depending on the number of lines or levels taken between the sea level and the highest point in the region.

Con'traband, in commerce, all goods and wares exported from or imported into any country against the laws of said country. There are, also, a number of articles termed *contraband of war* which neutrals may be prevented, by one belligerent, from carrying to another.

Con'tract, in law an agreement or covenant between two or more persons, in which each party binds himself to do or forbear some act, and each acquires a right to what the other promises. Contracts may be in express terms or implied from the acts of the parties; they may be verbal or written, and at common law both forms are binding; but by statute law a promise must be in writing. The law of contract occupies so large a space in all civilized systems of law that only a few of its more leading principles can be conveniently stated here. There is a general harmony in the jurisprudence of modern nations on this subject which is not to be found in other departments of law. The following definitions fully explain the character and meaning of the term contract:—

1. When one person signifies to another his willingness to do or abstain from doing anything with a view to obtaining the assent of that other to such act or abstinence, he is said to make a proposal.

2. When the person to whom the proposal is made signifies his assent thereto, the proposal is said to be accepted. A proposal when accepted becomes a promise.

3. The person making the proposal is called the promiser, the person accepting the proposal the promisee.

4. When at the desire of the promiser the promisee or any other person has done or abstained from doing, or does or abstains from doing, or promises to do or abstain from doing something, such act or abstinence or promise is called the consideration for the promise.

5. Every promise and every set of promises forming the consideration for each other is an agreement.

6. Promises which form the consideration or part of the consideration for each other are called reciprocal promises.

7. An agreement not enforceable by law is said to be void.

8. An agreement enforceable by law is a contract.

9. An agreement which is enforceable by law at the option of one or more of the parties thereto, but not at the option of the other or others, is a voidable contract.

10. A contract which ceases to be enforceable by law becomes void when it ceases to be enforceable

Certain classes of persons are under peculiar disabilities in matters of contract, viz., infants, lunatics, and married women. 1, As a general rule at common law contracts made by an infant (a person under twenty-one years) are voidable unless they are in some way for his benefit, and in particular for "necessaries." The protection of infants has been extended by the court of chancery to "expectant heirs," as they are called, i. e., persons who borrow money on the credit of their expectations. 2, A married woman, being in the eye of the law merged in her husband, cannot bind herself by contract. 3, Contracts made by a lunatic are voidable, except where his state of mind was not known to the other contracting party. The principle is extended to drunkenness. The general rule as to corporations is that they can only make binding contracts under their common seal, excepting in cases of "convenience almost amounting to necessity." See *Corporations.*

The contract must be founded on a consideration either of money or some act whereby an undoubted advantage accrues to the party sued. Lastly, the contract is voidable, if obtained by fraud, mistake, or compulsion.

Contrac'tions, abbreviations employed with the view of saving labor in writing, and also in former times with the view of saving parchment in extending MS. copies of works, deeds, etc. Contraction takes place in several modes, as by elision; writing a smaller letter above the word contracted; running two or more letters into one character; by symbols representing syllables or words, and by initial letters.

Contral'to, in music, the highest voice of a male adult, or the lowest of a woman or a boy, called also the *Alto*, or when possessed by a man *Counter tenor*. It is next below the treble and above the tenor, its easy range being from tenor G to treble C.

Co'nus, a genus of gasteropodous mollusks, the type of the family Conidæ or cone shells, so named from the conical form of the shell. They are found in the southern and tropical seas.

Convol'vulus, a genus of plants, consisting of slender, twining herbs with milky juice, bell-shaped flowers, and five free stamens. Some species are commonly known as bindweeds; others are cultivated in gardens. Minor convolvulus, with its large flowers of violet blue, with white and yellow center, is a familiar species. Scammony is obtained from the root of the *Convolvŭlus Scammonia*, a native of Syria. Some species, like the sweet potato, have tuberous and fleshy roots capable of being used as food.

Conway (or Aberconway), a town of North Wales, in Carnarvonshire, about 13 mi. e.n.e. of Bangor. It is notable for its old castle built by Edward I, a suspension bridge built by Telford, and a tubular railway bridge by Stephenson. Pop. 7,246. The river Conway has a course of about 30 mi. through much romantic scenery.

Conway, Hugh, the *nom de plume* of Frederick John Fargus, (1847–1875), British novelist.

In 1874 he wrote a dramatic story, *Called Back*, of which half a million copies were sold.

Conway, Moncure Daniel, an American clergyman, b. in Virginia, March 17, 1832, became at first a Methodist, and about 1856 a Unitarian. He was a strong opponent of slavery. For many years (1863–1884) he preached or lectured at South Place chapel, London. and wrote on political, social and religious subjects in the liberal press.

Cony′za, a genus of plants, natural order Compositæ, annual or perennial herbs, scattered over the warmer regions of the earth, a few being found in temperate countries. None possess properties of any value.

Cooch Behar′ (or Kuch Behar′), a native state in India, in political relation with the government of Bengal. Area 1,307 sq. mi; pop. 602,624. The chief town, Cooch-Behar, contains some handsome public buildings and a splendid new palace of the Maharajah. Pop. 9,535.

Cook, Eliza (1818–1889), British poetess. About 1840 she published a volume of domestic poems, and later established *Eliza Cook's Journal.* She was a favorite of the English middle class, and wrote verses such as *The Old Arm Chair*, etc.

Cook, James (1728–1779), a famous British navigator, b. in Yorkshire. In 1755 he entered the royal navy, and four years later as sailing master of the *Mercury* performed valuable services in surveying the St. Lawrence River and the coast of Newfoundland. Some observations on a solar eclipse, communicated to the Royal Society, brought him into notice, and he was appointed commander of a scientific expedition to the Pacific, with the rank of lieutenant in the navy. During this expedition he successively visited Tahiti, New Zealand, discovered New South Wales, and returned by the Cape of Good Hope to Britain in 1771. In 1772 Captain Cook, now raised to the rank of a commander in the navy, commanded a second expedition to the Pacific and Southern Oceans, which resulted like the former in many interesting observations and discoveries. He returned to Britain in 1774. Two years later he again set out on an expedition to ascertain the possibility of a northwest passage. On this voyage he explored the western coast of North America, and discovered the Sandwich Islands, on one of which, Hawaii, he was killed by the natives.

Cook, Joseph, an American preacher, b. in Ticonderoga, N. Y., Jan. 26, 1838; graduated at Harvard in 1865. He became well known as a preacher and lecturer.

Cookery, the preparation of food so as to render it more palatable and more digestible. The art is of great importance, not only for comfort but also for health, Food is mainly prepared by submitting it to the action of fire, as by roasting, boiling, stewing, etc. These processes give each a different flavor to food, but result alike in rendering the tissues, both of animal and vegetable food, softer and much more easily dealt with by the digestive organs. The art of cookery was carried to considerable perfection among some of the ancient nations, as for instance the Egyptians, Persians, and Athenians. Extravagance and luxury at table were notable features of Roman life under the empire. Among moderns the Italians were the first to reach a high degree of art in this department. Their cooking, like that of the ancient Romans, is distinguished by a free use of oil. Italian cookery seems to have been transplanted by the princesses of the house of Medici to France, and was carried there to perhaps the highest degree of perfection; even yet the skill and resource which the French cook shows in dealing often with very slight materials is a highly creditable feature in the domestic economy of the nation.

Cook's Inlet, an inlet of the North Pacific Ocean, running into the Territory of Alaska for about 150 mi.; explored by Captain Cook in 1778.

Cook's Islands, a name of the Hervey Islands, given to them because discovered by Captain Cook.

Cook's Strait, the channel which separates the two principal islands of New Zealand, discovered by Captain Cook in 1770.

Coolers, Water, vessels of porous, unglazed earthenware, in which a liquid can be kept cool by constantly exuding through the substance of the ware and evaporating from the outer surface of the vessel.

Cooley, Thomas McIntyre, b. at Attica, N. Y., Jan. 6, 1824. He removed to Michigan and was admitted to the bar of that state in 1845. In 1859 he became professor, and subsequently dean of the faculty of the law department of the University of Michigan. In 1864 he was appointed to the state supreme bench, and in 1867 was elected chief justice. In 1890 he was placed at the head of the interstate commerce commission. Cooley is recognized as high authority on constitutional law. His work on torts is used as a text-book in many of the law schools. He was a member of the faculty of the University of Michigan until he died, Sept. 12, 1898.

Coom′assie, a town, West Africa, capital of Ashantee, 130 mi. n. of Cape Coast Castle. It was taken and burned by Sir Garnet Wolseley, at the head of the English expedition sent against the Ashantees in 1874. Pop. about 50,000.

Coombs, Leslie (1793–1881), American soldier. On June 2, 1813, he was made captain of spies in a regiment of Kentucky volunteers. In 1836 during the Texas struggle with Mexico, he raised a regiment of volunteers. In succession he became state auditor, and for several terms was elected to the legislature. When the war with Mexico began, he was active in raising volunteers in Kentucky. In 1860 he was chosen clerk of the Kentucky court of appeals. During the Civil War General Coombs was ardently devoted to the cause of the Union. He was a convincing speaker.

Cooper, Sir Astley Patson (1768–1841), English surgeon, was b. in Norfolk. He studied medicine in London, and attended the lectures of John Hunter. In 1794 he was ap-

pointed professor of anatomy at Surgeon's Hall, and in 1800 head surgeon of Guy's Hospital. In 1822 appeared his great work on *Dislocations and Fractures*. Shortly after he became president of the Royal College of Surgeons.

Cooper, James Fenimore (1789–1851), American novelist, b. at Burlington, N. J., studied at Yale College, and entered the American navy as a midshipman at the age of sixteen. In 1821 appeared the novel of *Precaution*, the first production of his pen. Though successful it gave no scope for his peculiar powers, and it was not till the production of the *Spy* and the *Pioneers* that he began to take a high place among contemporary novelists. After that came a steady flow of novels dealing with life on the sea and in the backwoods, most of which, like the *Pilot*, *Red Rover*, *Waterwitch*, *Pathfinder*, *Deerslayer*, and *Last of the Mohicans*, are familiar names to the novel-reading public. After visiting Europe and serving as consul for the U. S. at Lyons for three years, Cooper returned to America where he d. at Cooperstown, N. Y.

Cooper, Myles (1735–1785), English clergyman. He graduated at Oxford in 1760. In 1762 he came to America as an assistant to President Johnson, of King's College, where he became professor of mental and moral philosophy. In the year following he became president.

Cooper, Peter (1791–1883), American inventor, manufacturer, and philanthropist, b. in New York City. In 1808 he was apprenticed to John Woodward, a carriagemaker, and while with him invented a machine for mortising the hubs of carriages, which proved of great value to his employer. His business ceased to be successful after the conclusion of peace with Great Britain, in 1815, and he attempted the trade of cabinetmaking, the grocery business, and the manufacture of glue; for the latter he leased a factory for twenty-one years, and in addition to glue, made oil, prepared chalk, whiting, and isinglass. Subsequently he bought ten acres of land in Brooklyn, where the business has since continued. In 1828, he bought 3,000 acres of land in Baltimore, where he erected the Canton iron works. During the excitement over the building of the Baltimore & Ohio Railroad in 1830, he constructed from his own designs the first locomotive engine ever made in this country, the *Tom Thumb*, by which means the possibility of building railroads with little capital was demonstrated, and the Baltimore & Ohio Railroad was saved from bankruptcy. Soon after this he sold his iron works in Baltimore, and returning to New York built an iron factory, which he afterward turned into a rolling mill. In 1845 he removed his works to Trenton, N. J., and built three blast furnaces in Phillipsburg, the largest then known, bought the Andover iron mines, and built a railroad through the eight miles of country to bring the ore to his furnaces. He was president of the New York, Newfoundland & London Telegraph Company, the laying of the Atlantic cable having been accomplished largely by his efforts and liberality. He bought the property at the intersection of Third and Fourth avenues, between Seventh and Eighth streets, and built here from his own plans the Cooper Union for the advancement of science and art. During the financial agitation in the U. S. following the crisis of 1873, he was active in the Greenback movement. In 1876, the National Independent party nominated him for president of the U.S.

Coöperation, a term in social economics, which, though of generic significance in the science of industry and trade, has a specific and technical sense, implying the association of any number of individuals or societies for mutual profit, whether in the purchase and distribution of commodities for consumption, or in the production of commodities, or in the borrowing and lending of capital among workmen.

The most powerful coöperative force in the industrial system is what economists have termed "the division of labor," but that is in reality also a union and graduation of labor toward productive ends, and has its counterpart in the multiform divisions of capital in its application to the maintenance and extension of industry.

Coöperation, as technically understood, occupies a middle position between the doctrines of the communists and socialists on the one hand, and the private property and freedom of individual labor and enterprise on the other. It takes its departure from communism at a very definite and significant point. While the latter would extinguish the motive of individual gain and possession in the sentiment of a universal happiness or good, and remodel all existing rights, laws, and arrangements of society on a basis deemed consonant to this end, coöperation seeks, in consistency with the fundamental institutes of society as hitherto developed, to ameliorate the social condition by a concurrence of increasing numbers of associates in a common interest.

The coöperative societies, springing from this idea, though attended with the most varied fortune, have greatly increased in number and in amount of business in recent years. The form, particular objects, and organic rules of these associations are by no means uniform. But they may be divided into three general classes: 1, Societies of consumption, the object of which is to buy and sell to members alone, or to members and non-members under differing conditions, the necessaries of life or the raw materials of their industry; 2, societies of production, the object of which is to sell the collective or individual work of the members; 3, societies of credit or banking, the object of which is to open accounts of credit with their members, and advance them loans for industrial purposes. There are numerous modifications of the principle, such as friendly societies, burial societies, societies of workmen which undertake the execution of work by contract, arrangements of private firms by which the workmen share in the

profits of the employers, and building societies, now rife in most large towns, the object of which is to enable members to become owners of dwelling houses. But the above three categories define the distinguishing characteristics of the coöperative society proper. There are many coöperative societies in America. The Pillsbury flour mills of Minneapolis is the largest coöperative mill in this country. France, Germany, and England have numerous coöperation stores and factories. The Bon Marche in Paris is a coöperative store. In the U. S. coöperation has chiefly taken the form of building-loan associations for providing the members with houses of their own.

Cooper's Creek (or the Barcoo), called by the latter name chiefly in its upper course, the largest inland river of Australia, which rises in Queensland by two branches, the Thomson and Victoria (or Barcoo), and flows southwest to Lake Eyre.

Co-ordinates, in geometry, a term applied to lines, to which points under consideration are referred, and by means of which their position is determined. Co-ordinates either determine the position of a point in space or in a plane which is understood to contain all the figure under consideration. They determine position by straight lines only, or by a straight line and angles; in the latter case they are called *polar* co-ordinates. When co-ordinates are at right angles to each other they are called *rectangular* co-ordinates, and when they make any other angle with each other they are called *oblique* co-ordinates.

Coorg (or Kurg), a province in Southern Hindustan. Area 1,583 sq. mi.; pop. 173,055. The country has a healthy climate, and yields coffee, spices, timber, etc. The capital is Merkara.

Coot, a grallatorial bird of the rail family frequenting lakes and ponds. The common

Common Coot.

coot has a bald forehead, a black body, and lobated toes, and is about 15 in. in length. The nests, which are very large, strong, and compact, are composed of reeds and rank water-herbage, built sometimes near the water's edge, and sometimes on small islets at some distance from the shore. The coot of India, China, and Japan is said to be identical with

that of Europe, but the North American coot is now recognized as a distinct species.

Copaiba (Copaiva) (ko-pā'ba, ko-pā-va), the name of a balsam and an oil. The balsam is a liquid resinous juice flowing from incisions made in the stem of a plant, and several other species of the genus, growing in Brazil, Peru, etc. It consists of several resins dissolved in a volatile oil. The resins are partly acid and partly neutral; the oil is clear, colorless, and has an aromatic odor.

Co'pal is a gum-resin yielded by different trees in Africa, South America, India, and Australia, and differing considerably in its qualities according to its origin; but in general it is hard, shining, transparent, and citron-colored. When dissolved in alcohol or turpentine it makes a beautiful and very durable varnish. It resembles copal resin in color and odor.

Copan', a ruined city of Central America, Honduras, on the Copan River, with some remarkable remains.

Cope, Edward Drinker (1840–1897), American scientist. He graduated from the University of Pennsylvania and studied comparative anatomy in the Academy of Science, Philadelphia, the Smithsonian Institution, Washington, D. C., and in Europe. He was appointed professor in natural science in Haverford College in 1866, and afterward accepted that professorship in his alma mater. He was for a long time secretary and curator of the Academy of Natural Sciences, Philadelphia. He was a member of the Geological Society of France and the American Association for the Advancement of Science.

Copenha'gen, the capital of Denmark, on the Sound, the larger and older portion of it on the east side of the island of Zealand, a smaller portion on the north point of the island of Amager, with between them a branch of the sea forming the harbor. It has a citadel and several strong forts protecting it on the sea side; and is mostly well built, principally of brick. It has many buildings of interest. It has occasionally suffered much from fires and from hostile attacks, the most disastrous being the bombardment by the British from the 2d to the 5th of September, 1807. In 1801 the Danish fleet was here defeated by Sir Hyde Parker and Nelson. The environs in some parts are very fine. Pop. 312,859.

Copep'oda, an order of minute entomostracous fresh-water and marine crustacea, so named because their five pairs of feet are mostly used for swimming.

Coper'nicus (or Koppernigk), Nicholas (1473–1543), a famous astronomer b. at Thorn, Poland. Having studied medicine at Cracow, he afterward devoted himself to mathematics and astronomy, and in 1500 taught mathematics at Rome with great success. Returning to his own country he was made a canon in the cathedral of Frauenburg, and began now to work out his new system of astronomy. Doubting that the motions of the heavenly bodies could be so confused and so complicated as the Ptolemaic system made them, he was induced to

consider the simpler hypothesis that the sun was the center round which the earth and the other planets revolve. Besides this fundamental truth Copernicus anticipated, for he can scarcely be said to have proved, many other of the principal facts of astronomical science, such as the motion of the earth round its axis, the immense distance of the stars which made their apparent position the same from any part of the earth's orbit, etc. The great work in which Copernicus explained his theory was completed in 1530, and published at Nuremberg in 1543. He was excommunicated by the pope on account of it.

Co'ping, the top or upper covering of a wall made to project and slope so as to carry the rain-water clear of the wall.

Cop'ley, JOHN SINGLETON (1737–1815), was b. in Boston, Mass., and d. in London, where he settled in 1776, and acquired a reputation as a historical painter. He was elected a member of the Royal Academy in 1779. His most celebrated picture is the *Death of Lord Chatham*, now in the National Gallery.

Cop'per, one of the most anciently known metals, deriving its name from *Cyprus*, large supplies having in Greek and Roman times come from that island. It is a metal of a pale red color tinged with yellow. Next to gold, silver, and platinum it is the most ductile and malleable of metals; it is more elastic than any metal except steel, and the most sonorous of all except aluminum. Its conducting power for heat and electricity is inferior only to that of silver. It has a distinct odor and a nauseous metallic taste. It is not altered by water but tarnishes by exposure to the air, and becomes covered with a green carbonate. It occurs native in branched pieces, dendritic, in thin plates, and rarely in regular crystals, in the primitive and older secondary rocks. Blocks of native copper have sometimes been got weighing many tons. Its ores are numerous and abundant. Of these several contain sulphur and iron or other metal, such as copper-glance or vitreous copper, gray copper or Fahlerz, one of the most abundant and important ores, and copper pyrites or yellow copper, another abundant ore. The red oxide of copper forms crystals of a fine red color, and is used for coloring glass. There are two native carbonates, the blue and the green, the latter being the beautiful mineral *malachite*, the former also known as blue malachite. *Blue* vitriol is a sulphate, and is used for dyeing and preparing pigments, as are various other copper compounds. All the compounds of copper are poisonous. It is found in most European countries, in Australia and Japan, in Africa and in North and South America (especially in the vicinity of Lake Superior).

In extracting the metal from pyrites by the wet process, the ore is first roasted to get rid of the larger proportion of sulphur, then the calcined residue still containing sulphur is mixed with common salt, ground, and heated in ovens. The copper is thus converted into chloride, part of which volatizes, but is condensed along with arsenic and other substances, by passage through flues and water condensers. After some hours the calcined mixture is raked out of the ovens, cooled, and transferred to tanks, where it is exhausted by successive treatment with water. The solution, containing chloride of copper, sulphate and chloride of sodium, and iron salts, is next heated along with scrap-iron. Copper precipitates in the form of a ruddy, lustrous, tolerably compact mass, with a crystalline appearance, and mixed with metallic iron and oxide. The larger pieces of iron are picked out, the precipitate washed and drained, and then rendered compact by heating in a furnace. A slag containing the oxide of iron forms, and the copper, when judged sufficiently pure, is run into molds. Afterward this crude metal is refined and toughened in the usual way, and the slags are employed as in the Welsh process. Some of the alloys of copper, especially those containing tin and zinc, are of considerable importance, e. g., *bronze*, an alloy of copper with about 8 or 10 per cent. of tin; *bell-metal* composed of 80 parts of copper and 20 of tin; British bronze coinage, copper 95, tin 4, zinc 1. Copper is applied to a great many useful purposes. In sheets it is used for sheathing the bottoms of ships, covering roofs and domes, the constructing of boilers and stills of a large size, etc. It is also used in electrotyping and engraving, for various household utensils and fittings; but its use for household utensils is by no means free from danger on account of the action of acids on it, which produces verdigris. About half the copper mined in the world is taken from the copper mines of the U. S. The proportion of pure copper to copper ore is largest in the American mines. Once about two thirds of the American copper mined was required for local consumption, and the balance was exported mostly to England, France, and Belgium. It is remarkable that although copper as money, except in small denominations, is no longer in general use, the consumption of this metal, once used for money chiefly, is more than eight times as great as it was forty years ago. This is in great measure explained by the enormous development of the telegraph and the use of copper for cartridges, and for electrical appliances. In 1899 the copper produced in this country amounted to 472,778,000 pounds, and this added to 19,000,000 pounds of copper mixed with nickel, makes a total of 491,778,000 pounds of copper mined in the U. S. Of this amount about 275,000,000 pounds were exported, and 216,000,000 pounds were consumed in this country.

The American product of copper in 1894 was 160,000 tons; 1895 it was 170,000 tons, and in 1899 it was in excess of 236,000 tons, or ten times more than the total American product of copper sixteen years ago, and nearly 40 per cent. more than the total copper product of the world sixteen years ago. The enormous increase in the demand for copper is, in part, due to the increased need of it for electrical appliances, for copper is used for telephones, electric cars, trolley wires, and cables. The development of trolley lines in other countries and of the tele-

phone service has greatly increased the home demand for American copper. There has been a large increase in the exports of copper utensils, tco. While in 1895 10,000 tons of American copper were sent to England, the total amount for 1896 was 16,000 tons, an increase of more than 50 per cent.

The most productive copper districts of the U. S. are the north peninsula of Michigan, Montana, and Arizona. These three districts produce about nine tenths of all the copper mined in this country, but Colorado yields considerable, California some, and Utah is beginning to be a factor. The price of copper in the English market was just twice as much at the beginning of the Civil War as it is now, and Great Britain then produced 13,000 tons to 5,500 in the U. S. Now the English product is only 1,500 tons.

Cop′peras, sulphate of iron or green vitriol, a salt of a peculiar astringent taste and of a fine green color. When exposed to the air it assumes a brownish hue. It is much used in dyeing black and in making ink, and in medicine as a tonic. The copperas of commerce is usually made by the decomposition of iron pyrites.

Copper Glance, a copper ore of a lead or iron-gray color. It consists of 81 copper and 19 sulphur, and abounds in Cornwall and many European countries.

Cop′permine River, a river, British North America, which falls, after a course of about 250 mi., into the Arctic Ocean.

Copper-nickel (or Kupfernickel), an ore of nickel, an alloy of nickel and arsenic, containing about 60 of the former and 40 of the latter, of a copper color, found in the mines of Westphalia.

Copper-plate, a polished plate of copper on which the lines of some drawing or design are engraved or etched to be printed from; also a print or impression from such a plate.

Copper Pyri′tes (or yellow copper ore), a double sulphide of copper and iron composed in equal parts of copper, sulphur, and iron. It occurs mostly in primary and metamorphic rocks, and is the chief copper ore of England.

Cop′rolites, the term originally applied to the fossil excrements of extinct animals, chiefly lizards or sauroid fishes. They resemble oblong pebbles, and are found mostly in the Lias and Coal Measures. They consist chiefly of phosphates of calcium and magnesium, and the carbonates of the same metals, and organic matter, and as the fertilizing properties of these are well known, coprolites have been largely used as a manure. For this purpose they are reduced to powder and used as ground bones, or treated with sulphuric acid, so as to form superphosphate of lime.

Cop′tis, a small genus of plants, nat. order Ranunculaceæ, two species of which are found in Canada and the northern parts of the U. S.

Cop′yright, denotes the property which an author has in his literary works, or which any other person has acquired by purchase, and which consists of the exclusive right of publication; or the right which a designer, engraver,

painter, draughtsman, photographer, or sculptor has in his designs, engravings, paintings, etc. The copyright law of the U. S. gives the copyright of a work exclusively to the author for twenty-eight years with renewal to himself, his widow, or children for fourteen years more. In the case of encylopædias, reviews, magazines, and other periodical works, the copyright is vested in the proprietors as if they were the authors; but after twenty-eight years the copyright of all articles claimed by the authors reverts to them for the period of fourteen years still to elapse under the terms of this act. It is, of course, quite competent to the authors of such articles to reserve the right of publishing them in a separate form. Dramatic and musical compositions are subject to the same copyright as books. The exclusive right of performing dramatic and musical compositions not printed, or of causing them to be performed, belongs to the author or his assignees under the same rules of copyright as those relating to books. Lectures and public speeches are the property of the author and cannot be published without his consent, unless they are lectures delivered on any public endowment or foundation. Letters are the property of the writer, and the receiver has no right to publish them without the writer's consent. Any person pirating a copyright work is liable to a special action, and all copies of pirated works become the property of the proprietor of the copyright. In European countries copyright is generally for the author's life, and a varying period thereafter—twenty, thirty, or even fifty years. As to Canadian copyright, an author domiciled in Canada, or in any part of the British possessions, or being citizen of a state having an international copyright treaty with Great Britain, may secure copyright in Canada for twenty-eight years and renewal of it for fourteen years to himself or to his widow and children, but to no one else who may be in possession of the copyright.

A copyright may exist in a translation or in part of a work (as in notes or additional matter), with an exclusive right to the whole; but a *bona fide* abridgement of a book is not considered in America and England a violation of the original copyright. So a person may use fair quotation if by its application he makes it a part of his own work, but cannot take the whole or a large part of a work under the pretense of quotation.

International copyright is when nations make mutual arrangements as to copyright. In March, 1891, Congress passed an International Copyright act. By its terms the entire manufacturing of foreign copyrighted work must be performed in the U. S.

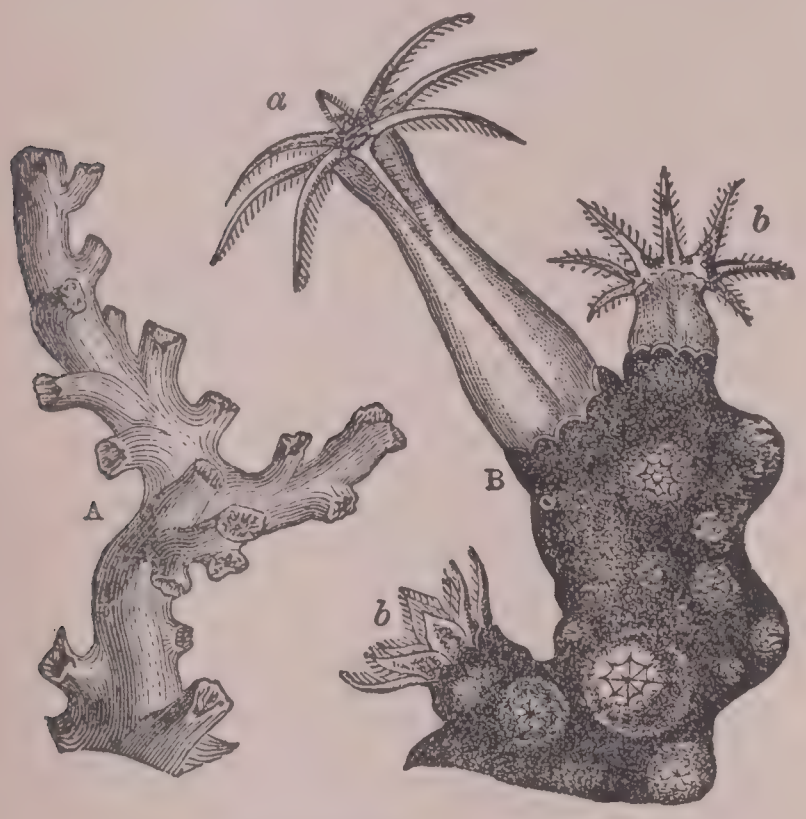
Coquelin, Benoit-Constant, French actor, b. in Boulogne, Jan. 23, 1841. Since 1884 he has been an associate of the *Theater Français.* M. Coquelin stands at the head of the dramatic profession in France, and has played with great success in England and the U. S.

Coquimbo (ko-kim′bō) (or La Serena), a town of Chile, capital of the province of Coquimbo. Pop. 13,000. Porto Coquimbo, the

port of the above, from which it is distant 7 mi. to the s.w., has smelting works and a large export trade, chiefly in copper and the precious metals. Pop. 5,100. The province is rich in copper, silver, gold, and other metals, and is mountainous. Pop. 165,474.

Coquito (kō-kē-′tō), a very beautiful palm of Chile, allied to the cocoanut, growing to the height of 40 or 50 ft., yielding a rich, sweet sap, which when boiled is called palm honey.

Coral is the name applied to the Zoophytes, having the property of secreting lime from the ocean and incorporating it among the tissues of their own bodies, as well as to their calcareous remains. There are two kinds of corals, the reef-building corals where the calcareous substance is deposited in the walls of the body, and the red coral of commerce in which the deposit is external. In composition coral consists chiefly of carbonate of calcium with variable quantities of salts. Coral reefs are composed of the calcareous remains of polyps, and are divided into fringed, barrier, and lagoon. The fringed reefs are often converted into barrier reefs. The coral of commerce and the arts is the production of various polyps and is of different colors and internal structure. The red, pink, and black are most highly prized. The red coral has a branching, shrublike form and is found in the Mediterranean. Coral fishing is carried on in various parts of the Mediterranean. The raw coral is wrought chiefly in Leghorn, Genoa, and Naples, whence it is sent to the East Indies, Germany, Russia, etc. The value of the coral brought yearly to Genoa amounts to nearly $2,500,000. Coral is capable of taking a good polish.



A.—Branch of Dendrophyllia; *B.*—Part of a stock of red coral, with (*a*) fully extended polyp, and (*b, b*) two polyps, partly extended.

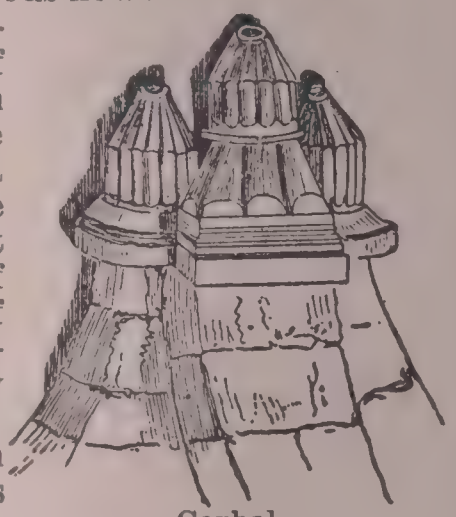
Coral Fishes, a name given to several fishes of different genera. They are found in all tropical seas, especially about coral reefs, and are all brilliantly colored. The most important is the "emperor of Japan" which measures about 15 in. in length, and is the most esteemed of all the Indo-Pacific fishes.

Coral Rag, in geology, the highest member of the middle Oolitic series—a variety of limestone containing an abundance of petrified corals, occurring in some parts of England.

Coral Sea, part of the Pacific on the northeast of Australia between it and the Solomon Islands and the New Hebrides.

Coral Tree, the name of leguminous trees and shrubs, natives of Africa and America, with trifoliolate leaves and beautiful scarlet spikes of papilionaceous flowers.

Cor′bel, in architecture, a piece of stone, wood, or iron projecting from the vertical face of a wall, to support some superincumbent mass. Corbels are of a great variety of forms, and are ornamented in many ways.



Corbel.

Corbie Steps, in architecture, steps into which the sides of gables from the eaves to the apex are broken. They are common in old Scotch architecture, into which they were probably introduced from France.

Corbie Steps.

Corcoran, Wm. Wilson (1798–1888), American banker and philanthropist. In 1828 he had charge of the real estate held by the U. S. Bank and the Bank of Columbia in the District of Columbia, and continued their agent until 1836. In 1835 he was married to Miss Louise A. Morris. It was in 1837 that he began his career as banker and broker in Washington. In 1854 he retired from the banking business and after gave much of his time to objects of benevolence.

Corday D'Armans (kor-dā-där-mäṇ), Marie Anne Charlotte (1768–1793), commonly called Charlotte Corday, was born in Normandy. Her lover, an officer in the garrison of Caen, was accused by Marat as a conspirator against

the republic, and assassinated by villains hired for that purpose. This, as well as a deep-rooted hatred against all oppressors, determined Charlotte Corday to free her country from Marat. Having obtained an interview with Marat at his own house, she plunged her dagger into his bosom, and gave herself up to the attendants who rushed in at his cries. When tried for the murder before the revolutionary tribunals, she was condemned to the guillotine and executed.

Cor′dova, an ancient Spanish city on the Guadalquivir, in Andalusia, capital of a province of same name. The cathedral is a splendid building, originally a mosque, erected in the eighth century by King Abderahman. The town is well supplied with schools, hospitals, and other institutions. It has always carried on considerable trade; and under the Moors the leather exclusively manufactured there (cordovan) was exported in all directions. Cordova, which was founded by the Romans, became the capital of Arabian Spain and the center of Arabian splendor and science under the caliphs of the West. At this time it is said to have had a pop. of 1,000,000. With the decay of the Moorish Empire it fell into the hands of Ferdinand III of Castile. Pop. 55,-614. The province includes the fertile and beautiful valley of the Guadalquivir and the mountains of Sierra Morena. Area 5,188 sq. mi.; pop. 420,728.

Cor′dova, a town of the Argentine Republic, capital of province of same name. It occupies a beautiful and well-sheltered site in the valley of the Primero, and has railways to Rosario and Tucuman. Pop. 67,200. The province has an area of 54,000 sq. mi., and a pop. of 377,200.

Cor′dovan, a fine leather which took its name from the city of Cordova, where it was manufactured in large quantities. Much is now made in Northern Africa and the Levant.

Corduroy′, a thick cotton stuff corded or ribbed on the surface. *Corduroy road,* in the **U.** S., a road constructed with logs laid together over swamps or marshy places for carriages to pass over.

Corea. See *Korea.*

Corelli, Arcangelo (1653–1713), Italian musician. By his sonatas for the violin, and by his concerti, he may be considered the creator of a new species of harmony, especially for his own instrument, the violin.

Corentyn (kor′en-tīn), a river of South America separating British and Dutch Guiana. It has a course of 300 mi., and is navigable 150 mi.

Cor′fu, a Greek island in the Mediterranean, the most northerly of the Ionian Islands. Area 427 sq. mi.; pop. 118,730. The surface rises at one point to the height of 3,000 ft.; the scenery is beautiful, the climate pleasant and healthy, the soil fertile. Oranges, citrons, grapes, honey, wax, oil, and salt are abundant. A Corinthian colony settled in the island in the eighth century B.C. The Venetians possessed Corfu from 1386 to 1797, the British from 1815 to 1864. Corfu, the capital, is finely situated on a promontory, which terminates in a huge insulated rock, crowned by the citadel; the streets are Italian in style; chief edifices, the cathedral, government palace, and Ionian academy. There is a good harbor and considerable trade. Pop. 21,670.

Corian′der, an umbelliferous plant, native of Italy, and cultivated in other parts of Europe. The whole plant has an unpleasant smell, but the fruit, improperly called seed, is very agreeable and aromatic when dry. It is used as a carminative and aromatic in medicine, and as an ingredient in cookery and confectionery.

Corin′na, an ancient Greek poetess of Tanagra, in Bœotia, contemporary with Pindar (about 500 B. C.), whom she is said to have conquered five times at musical contests. Only a few fragments of her songs have come down to us.

Cor′inth, a once celebrated city upon the isthmus of the same name, which unites Peloponnesus with Northern Greece. It was renowned among the cities of Greece, commanded by its advantageous position a most important transit trade, and possessed all the splendor which wealth and luxury could create; while its citadel, the Acrocorinthus, nearly 2,000 ft. high, rendered it a strong fortress. Only a few ruins remain to attest its ancient magnificence. It had two harbors, Lechæum on the west side of the isthmus, on what is now the Gulf of Corinth, or Lepanto, and Cenchreæ, on the Gulf of Athens or Ægina. Near Corinth were held the Isthmian games. Besides being one of the most magnificent, it was also one of the most voluptuous cities of Greece. After many political vicissitudes Corinth became the head of the Achæan League, and was conquered and destroyed by the Roman consul Mummius, 146 B. C. Julius Cæsar, about a hundred years later, rebuilt it; but its commerce could not be restored, though it became a place of note and importance. St. Paul lived here a year and a half, and two of his epistles are addressed to the Corinthians, *New Corinth* is a village on the shore of the gulf, several miles n.w. from the site of ancient Corinth; it is the seat of an archbishop. Pop. 4,150.

Corinth, Gulf of (or Gulf of Lepanto), a beautiful inlet of the Mediterranean, about 80 mi. long, between the Peloponnesus and Northern Greece, having the Isthmus of Corinth closing it in on the east.

Corinth, Isthmus of, the isthmus which connects the Morea (Peloponnesus) with Northern Greece, varying in width from 4 to 8 mi. A canal, begun in 1882 and about 4 mi. long, across the isthmus, enables vessels to sail from the Archipelago to the Adriatic without rounding Cape Matapan.

Corinthian Order, that order of Grecian architecture of which the most characteristic features is the capital of the column, which is adorned with beautifully carved acanthus leaves, but varies considerably in minor details. The column is generally fluted, with a fillet between the flutings, and stands upon a base. The

entablature is variously decorated, especially the cornice; the frieze may be quite plain, or sculptured with foliage and animals. The Corinthian order was not very common in Greece before the time of Alexander the Great; among the Romans it was much employed.

Coriola'nus, the name given to an ancient Roman, Caius, or more properly, Cneius, Marcius. He was banished for seeking to deprive the plebeians of their hard-earned privileges, and in particular of the tribuneship; and seeking revenge, he took refuge among the Volsci, the bitterest enemies of Rome, and prevailed upon them to go to war with her. The Volscian army, after making itself master of the cities of Latium, was pitched in sight of Rome before troops could be raised for the defense. The Roman senate made unavailing overtures for peace, till at length the tears of Veturia his mother, and Volumnia his wife, when they appeared at the head of the Roman matrons, induced Coriolanus to withdraw his army from before Rome.

Cork, a city in the south of Ireland, capital of the county of Cork, situated on the river Lee. It is 15 mi. from the sea, and besides an upper harbor at the city itself, and quays extending over four miles in length, there is a lower harbor at Queenstown, 11 mi. below the town. The entrance, deep and narrow, is strongly fortified on each side. Cork is the third city in Ireland, and exports great quantities of grain, butter, bacon, hams, eggs, and live stock. The principal industries are tanning, distilling, brewing, and making of tweeds and friezes. There are also iron foundries and yards for the building of iron ships. The principal buildings are the Protestant and Roman Catholic cathedrals, exchange, customhouse, chamber of commerce, courthouse, Queen's college, etc. There is a naval dockyard at Haulbowline, an island within Cork harbor. Cork sends two members to Parliament. Pop. 75,345. The county is the most southerly and largest in Ireland, having an area of 2,885 sq. mi. The west part is mountainous, the north and east very fertile. The coast is indented with numerous bays and inlets, of which the more important are Bantry Bay, Kinsale and Cork harbors. The climate is remarkably mild, though moist. The county is watered by the Bandon, Lee, and Blackwater. Cattle, sheep, pigs, and quantities of butter are exported. The fisheries are important. The county has seven political divisions, each sending a member to Parliament. The county town is Cork; other towns are Queenstown, Fermoy, Youghal, Bandon, Mallow, and Kinsale. Pop. 438,432.

Cork is the external bark of a species of oak which grows in Spain, Portugal, and other southern parts of Europe and in the north of Africa, and is distinguished by the great thickness and sponginess of its bark, and by the leaves being evergreen, oblong, somewhat oval, downy underneath, and waved. The outer bark falls off of itself if left alone, but for commercial purposes it is stripped off when judged sufficiently matured, this being when the tree

has reached the age of from fifteen to thirty years. The first stripping yields the coarsest kind of bark. In the course of eight or nine years, or even less, the same tree will yield another supply of cork of better quality, and the removal of this outer bark is said to be beneficial, the trees thus stripped reaching the age of 150 years or more. The bark is removed by a kind of ax, parallel cuts being carried round the tree transversely and united by others in a longitudinal direction, so as to produce oblong sheets of bark. These vary in thickness between three-fourths of an inch and three inches. Care must be taken not to cut into the inner bark, or the tree would be killed. The pieces of cork are flattened out by heat or by weights, and are slightly charred on the surface to close the pores. Cork is light, elastic, impervious to water, and by pressure can be greatly reduced in bulk, returning again to its original size. These qualities render it peculiarly serviceable for the stopping of vessels of different kinds, for floats, buoys, swimming belts or jackets, artificial limbs, etc.

The cork is sorted into four grades after which it is put into sheet-iron boxes and steamed. The cork is steamed so it will not take the temper out of the circular knives or punches which slice up the cork and make it into stoppers. The hollow punch which cuts into the cork twists around about 800 times a minute as it goes through the sheet, and the disk-shaped knife revolves 600 times a minute. The circular knife which slices the cork into strips, which are just as wide as the corks to be punched from it, is a disk of fine-tempered, thin steel about 28 in. in diameter. The revolving knife cuts the cork across the grain, the strips varying from 8 to 18 in. in length, and as wide as the cork is long. The punches or cutters are hollow cylinders made of the finest grade of tool steel and vary from an eighth of an inch to two and a half inches in diameter. The punch works horizontally and is held in place by a chuck on the end of the shaft. The shaft is drawn forward against the strip of cork which is held against a stop. A straight cork is made every time the shaft is drawn forward. As the punch returns to its original position the cork is forced out of it by a plunger and it rolls into a basket beneath. About 18,000 corks can be punched in a single day by one of these machines. The leavings from the strips of cork are granulated for insulating material and packing for ice-houses and refrigerators. The straight corks are taken to a tapering machine which is a large circular knife revolving in a horizontal position. The corks are fed into a device which carries them up against the knife. The cork is held in a slanting position and the knife cuts off shavings so as to give a bevel or taper to the cork. The corks are then selected into different grades and placed in packages for shipment.

Cork, Fossil, a kind of mineral, a species of asbestos.

Corliss, George Henry (1817–1888), American inventor. The construction of stationary

steam engines was revolutionized by his improvements. He invented many ingenious devices.

Cor′morant, the name of several large web-footed birds of the pelican family, or forming a family by themselves. They have a longish and strongly hooked bill, long neck, short wings, and rather long, rounded tail; all the toes are united by a web, and, though excellent swimmers, they are able to perch on trees: color generally black or dark. The common cormorant of Europe is larger than a goose, but with smaller wings. It occupies cliffs by the sea, feeds on fish, and is extremely voracious. It dives and swims with great power, and pursues its prey beneath the surface of the water, often to a great depth. Among the Chinese cormorants have long been trained to fish for man. At first a ring is placed on the lower part of the bird's neck to prevent it swallowing the prey, and in time it learns to deliver the fish to its master without such a precaution being necessary. Another British cormorant is the green cormorant or shag. It is smaller than the common cormorant. Both these species are found also on the eastern coasts of America, and there are various other American as well as Australian species.

Cormorant.

Corn is the generic term for all kinds of grain used for making bread, and is applied specifically to the principal breadstuff; in England to wheat, in the U. S. generally to maize, and frequently in Scotland to oats.

Corn, INDIAN (or Maize), is the produce of *Zeamays*, a species of cereal. The stem, which is filled with a pithy, fibrous structure, is divided at irregular intervals by nodes, and its strength and solidity is increased by a siliceous outside covering. From the lowest, and sometimes also the second and third node, it sends out "brace" roots, and these help to support the plant, which sometimes grows to 10 ft. in height, the minimum being generally 3 ft. The ears — which are developed within the leaf-sheaf at the nodes, and consist of a "cob" with the grains disposed upon it in regular rows of from eight to twenty, and long "silk" threads attached to each embryo, which usually extend beyond the closely folded

tip of the mass of imbricated leaves ("husk") that wraps the whole — are from half an inch to 3 in. in diameter, and from 2 to 17 in. in length. The stem is topped by a "tassel," producing an abundance of light, dry, loosely-attached pollen. It is held to be superior in nutriment to barley, buckwheat, and rye. By analysis it gives 77 per cent. of starch; 3 of zein, a principle analogous to gluten; 2.5 of albumen; 1.45 of sugar; .8 of extractive; 1.75 of gum; 1.5 of sulphate and phosphate of lime; 3 of lignin; and 9 of water. It is more generally used in America (North and South) than in the other continents — in the U. S. the crop is 2,150,000,000 bu., or about two-thirds of all the grains grown; but in the Mediterranean countries, Germany, etc., it is also highly valued. The green ears of the sweet varieties are boiled and eaten from the kernel or served in milk. When coarsely ground corn forms the *hominy*, and finer ground it furnishes the *mush* or porridge. *Pop-corn* is a variety whose grains can be roasted and turned and shaken smartly over a brisk fire till they swell and burst, turning inside out; in this state they are coated with syrup and pressed into a ball, or the separate grains are simply sprinkled with salt. The deficiency of gluten in the meal of maize renders it ill adapted to bread-making; but *johnny-cakes* made from it are popular. Large quantities of starch are manufactured from corn, both for laundry purposes and for making puddings, custards, and blanc-mange; and the starch, by treatment with acid, is converted into glucose or grape sugar. The canning of green sweet corn is also an important industry in some states. By the Mexicans the small young shoots of thickly-sown crops are served at table like asparagus and as dessert. The stems of sugar corn when full grown yield by pressure a thin sweet juice, which unfermented gives a pleasant syrup and from 5 to 15 per cent. of sugar, fermented a beer called *chica*, and distilled an excellent spirit resembling brandy. In countries where corn does not ripen well it is sometimes sown to afford food for poultry, or to be mown as green fodder for cattle. Where it is cultivated for its grain the dried leaves are used as winter fodder. The stalks are used for thatch and for fuel, and for making baskets. The fibers of the culm and leaves afford a durable kind of yarn; and the husks are elastic, and can be applied to the stuffing of chairs, saddles, etc., and to the manufacture of good durable mattresses, which have become a profitable article of trade in Paris and Strasburg. The husks are also much used for packing oranges and lemons, and in South America for making cigarettes; and good paper has been manufactured from them. Hollowed corn-cobs make homely but serviceable pipe-heads for smoking tobacco. There are few plants of which the uses are more various than corn, and few which are of greater importance to man. Another species of maize, called Chile Maize or Valparaiso Corn, is distinguished by its serrated leaves. It is a smaller plant, a native of Chile, and has

won a superstitious regard because its grains when roasted split in the form of a cross. The native country of corn is uncertain. In an ancient Chinese encyclopædia in the royal library at Paris is an excellent representation of the plant; so that while it was undoubtedly first introduced to Europe about the year 1520 by Columbus from America, there are good grounds for the conclusion that it was known and cultivated in the ancient world long before that time.

Corna′ceæ, a natural order of polypetalous exogens, consisting of about 100 species, two of which are found in Britain, a lowly Alpine plant and the common dogwood or prickwood. Several plants of this order are of service as tonics and for the cure of ague.

Corn Crake (or Landrail), a species of bird of the order Grallæ or Waders, and of the family Rallidæ or rails. The crakes differ from the rails proper in having the bill shorter.

Corn Crake.

The name is expressive of its cry. It feeds on worms and insects. It is a bird of passage, frequenting the northern parts of Europe during summer, and the southern, including the Mediterranean coasts of Africa, in winter.

Cor′nea, one of the coats of the eye, a transparent membrane in the fore part of it.

Corneille (kor-nā-yô), Pierre (1606–1684), the father of French tragedy and classic comedy, was born at Rouen. In 1635 he entered the field of tragedy with Medea; but it was not till the appearance of his next work, the famous *Cid*, that Corneille's claim was recognized to a place among the great tragic poets. After the *Cid* appeared in rapid succession *Horace*, *Cinna*, his masterpiece according to Voltaire, and *Polyeucte*, works which show Corneille's genius at its best.

Cornel (or Cornelian Tree), a species of dogwood, a tree or shrub of the order Cornaceæ, distinguished by the hardness of its wood, a native of Asia and the south of Europe. One of the finest, the round-leaved Cornel, is a large shrub, 5 to 10 ft. high, common from Virginia to Canada.

Corne′lian (or Carnelian), a gem of a light-red or flesh color. It consists of silica along with minute quantities of the oxides of iron, aluminum, and sometimes of other metals, and is used for seals, bracelets, necklaces, and other articles.

Corne′lius, Peter von (1787–1867), German painter. In 1811 he went to Rome, where, in conjunction with Overbeck, Veit, and other associates, he may be said to have founded a new school of German art, and revived fresco painting in imitation of Michael Angelo and Raphael.

Corne′lius Nepos, a Roman author of the first century B. C., the contemporary of Cicero and Catullus. The only extant work attributed to him is a collection of short biographies, probably an abridgment of a work written by Nepos. These biographies have long been a favorite school book, and popular editions of them are very numerous.

Cornell, Alonzo B., son of Ezra Cornell, was b. in Ithaca, N. Y., 1832. In 1879 he was elected governor of New York and served till Dec. 31, 1882.

Cornell, Ezra (1807–1874), American inventor and philanthropist, b. in New York state. He realized a large fortune through his connection with the electric telegraph system, and devoted a greater part of it to the endowment of Cornell University, at Ithaca, N. Y.

Cornell University, at Ithaca in the state of New York, was established in 1867 with funds furnished from the income of 990,000 acres of public land allotted by Congress to the state for this purpose and with a foundation of $500,000 presented by the Hon. Ezra Cornell, much augmented by subsequent donations. There are five general courses, including classics, literature and philosophy, science, engineering, architecture, agriculture, etc., all of which lead to a bachelor's degree.

Cornet, a wind instrument of former times, originally curvilinear or serpentine in form and increasing in diameter from the mouthpiece to the lower end. The modern cornopean is a kind of keyed bugle which has a very agreeable tone, and is much used in orchestras and military bands. Several forms of it are in use.

Corning, Steuben co., N. Y., on Chemung River. Railroads: Erie; Lackawanna; and Fall Brook. Industries: glass works, flouring mills, three iron foundries, lumber mills, novelty works, factories for the manufacture of agricultural implements, cabinets, etc. Surrounding country agricultural. Corning became a city in 1890. Pop. 1900, 11,061.

Corn Laws, a name commonly given to certain statutes passed to protect the agricultural interest in Britain. The first form of interference by legislative enactment with the corn trade in England, beginning soon after the Conquest, was the prohibition of exportation, an expedient in those times to prevent scarcity in a sudden emergency. The exportation of grain was prohibited in the reign of Edward III in 1360–61, Calais and other appointed ports being excepted. This provision was relaxed by a statute of Richard II in 1394, by which exportation was permitted from all ports not excepted by royal proclamation. In 1436, under

Henry VI, the exportation of grain was permitted without license whenever the price of wheat did not exceed 6*s.* 8*d.* per quarter, and barley 3*s.* 4*d.* At the restoration of Charles II duties were imposed both on exportation and importation, while the old principle of a standard price, beyond which exportation was prohibited, was retained. In 1804 if the price of corn was below 63*s.* a prohibitory duty of 24*s.* 3*d.* was laid on what was imported; if between 63*s.* and 66*s.*, a duty of 2*s.* 6*d.*; and only when the price at home had risen as high as 66*s.* per quarter was the foreign grain allowed to pass at a nominal duty of 6*d.* With variations of more or less importance this sliding scale of prohibitory duties continued in force till 1846, when Sir Robert Peel, influenced by the corn-law repeal agitation, and more especially by the Anti-Corn-Law League, headed by Cobden and Bright, carried a measure repealing the duty on imported corn, except a nominal sum of 1*s.* per quarter, which also in 1869 was done away with, thus leaving the importation of corn entirely free.

Corn Marigold (*Chrysanthĕmum segĕtum*), a common weed in British corn fields, of a rich orange color.

Corn Moth, a small moth, the larva of which is exceedingly destructive to corn sheaves in the field, and to stored grain, from eating into the grains. Salt, frequent turning, and many expedients are employed to destroy the eggs.

Cornplanter, a Seneca Indian chief, said to have been over a hundred years old at his death, in 1836. He was a bitter enemy of the whites; joined the French at the time of General Braddock's expedition, and took part in the Wyoming massacres.

Cornucopiæ ("horn of plenty"), a wreathed horn filled to overflowing with fruit, flowers, and grain; used as the symbol of plenty.

Corn'wall, a maritime county of England, forming the southwestern extremity of the island. Area 1,350 sq. mi.; pop. 318,583. The chief wealth of the county is in its minerals, especially its mines of copper and tin, though the value of both has diminished. Several mines exceed 350 fathoms in depth. Besides tin and copper, silver, lead, zinc, iron, manganese, antimony, cobalt, and bismuth are found in comparatively small quantities. There are also valuable deposits of kaolin or china-clay. There are no manufactures, but the fisheries, particularly of pilchard and mackerel, are valuable. Cornwall, with the Scilly Isles, seems to have been the Cassiterides or Tin Islands of antiquity. The natives long maintained their independence against the Saxons, and their country was spoken of as West Wales. Their language also long continued to be Celtic. The chief towns are Bodmin (county town), Penzance, Truro, and Falmouth (with Penryn).

Cornwall, a port and manufacturing town of Canada, prov. Ontario, on the north side of the St. Lawrence, 67 mi. above Montreal. Pop. 6,805.

Corn'wallis, Charles, Marquis of (1738–1806), British soldier, son of the first Earl

Cornwallis. On the outbreak of the American war he sailed with his regiment, served with distinction under Howe and Clinton, and in 1780 was left in independent command in South Carolina with 1,000 men. He defeated General Gates at Camden, 1780, and fought General Greene at Guilford in 1781, but six months afterward was besieged in Yorktown and compelled to surrender Oct. 17, 1781. In 1786 Lord Cornwallis went out to India as commander in chief and governor general, invaded Mysore in 1791, and obliged Tippoo Sahib to surrender much territory. Having returned to Britain he was created a marquis (1794), appointed lord lieutenant of Ireland, and again in 1805 governor general of India.

Corn Weevil, a destructive insect which preys upon stored corn. It bores a hole and deposits its egg inside of the grain, which is afterward eaten to a husk by a grub.

Coro, a seaport town, Venezuela, at one time a flourishing place but now much decayed. Pop. 8,000.

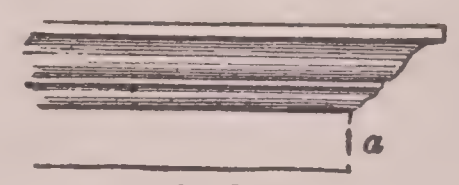
Corol'la, in botany, the portion of the flower inside the calyx; the inner floral envelope. The corolla surrounds the parts of fructification and is composed of leaves called petals.

Cor'ollary, in mathematics, a collateral conclusion, following from a proposition demonstrated.

Coroman'del Coast, the east coast of the Indian Peninsula, Madras Presidency, or that portion of it between Palk's Strait and the river Pennar.

Coromandel Wood, the wood of a tree found in Ceylon. Its ground color is chocolate brown, with black stripes and marks; it is hard, turns well, and makes very handsome furniture.

Coro'na ("a crown"). 1, In astronomy, a halo, or luminous circle round one of the heavenly bodies; specifically the portion of the aureola observed during total eclipses of the sun, which lies outside the chromosphere or region of colored prominences. 2, In botany, an appendage of the corolla in some flowers, coming as it were between the corolla and the stamens, well seen in the cup of the daffodil. 3, In architecture, the lower member of the projecting part of a cornice.



a, the Corona.

Corot (kō-rō), Jean-Baptiste-Camille (1796–1875), French artist, b. at Paris. He frequently painted figure subjects, including the large sacred pictures, the *Flight into Egypt* and the *Baptism of Christ;* but his most characteristic and successful work was in landscape. His woodland scenes, painted for the most part at dawn or twilight in a scheme of pale greens and silvery grays, show a singularly subtle feeling for this phase of nature, and are undoubtedly among the most important contributions of the century to landscape art.

Corporation. A corporation is an association of persons which the law treats in many respects as if it were itself a person. It has rights and duties of its own which are not the

rights and duties of the individual members thereof. Thus a corporation may own land, but the individual members of the corporation have no rights therein. A corporation may own money, but the corporators as individuals are under no obligation to pay the debt. If, however, an individual has not paid up his stock in full, he is liable for the amount unpaid. The rights and duties descend to the successive members of the corporation. This capacity of perpetual succession is regarded as the distinguishing feature of corporations as compared with other societies. One of the phrases most commonly met with in law books describes a corporation as a society with perpetual succession and a common seal. The latter point, however, is not conclusive of the corporate character. The legal attributes of a corporation have been worked out with great fullness and ingenuity in English law, but the conception has been taken full-grown from the law of Rome. The technical term in Roman law corresponding to our corporation is *collegium;* a more general term is *universitas.* A *collegium* or *corpus* must have consisted of at least three persons, who were said to be *corporati—habere corpus.* They could hold property in common and had a common chest. They might sue and be sued by their agent. There was a complete separation in law between the rights of the *collegium* as a body and those of its individual members. The *collegium* remained in existence although all its original members were changed. It was governed by its own by-laws, provided these were not contrary to the common law. The power of forming *collegia* was restrained, and societies pretending to act as corporations were often suppressed. In all these points the *collegia* of Rome closely resemble the corporations of English law. There is a similar parallel between the purposes for which the formation of such societies is authorized in English and Roman law. The Roman conception of a corporation was kept alive by ecclesiastical and municipal bodies. When English lawyers came to deal with such societies, the corporation law of Rome admitted of easy application. Accordingly, in no department of our law have we borrowed so copiously and so directly from the civil law. The corporations known to the earlier English law were mainly the municipal, the ecclesiastical, and the educational and eleemosynary. To all of these the same principles, borrowed from Roman jurisprudence, were applied. The different purposes of these institutions brought about in course of time differences in the rules of the law applicable to each. In particular, the great development of trading companies under special statutes has produced a new class of corporations, differing widely from those formerly known to the law.

Corporations are divided into two main classes, public and private. Public corporations are such as municipal corporations of states, counties, cities, villages, or incorporated official boards of officers, as a park board. Of private corporations there are four classes:

1. A corporation for the benefit of the members. In such a corporation there is no stock, no capital, and no pecuniary profit. Examples are social, artistic, scientific societies, religious and professional societies, clubs, etc.

2. Corporations for the pecuniary profit of individual members. The basis is a capital engaged in commercial enterprise. Shares of stock are held by stockholders. Such corporations are regulated in the U. S. by statutes, which designate the relations and privileges of the corporation. Such corporations are organized and chartered for a specific purpose, and cannot transact business other than that for which they are organized. Examples are railroads, telegraph and telephone companies, insurance and banking corporations. The profits are divided pro rata.

3. Corporations for mutual aid and relief. The first object is the element of personal membership and benefit; the division of profit is a secondary consideration. Examples: building and loan associations, co-operative societies, lodges of various kinds, etc. Such corporations are generally under state control.

4. Incorporated trusts. Such corporations have a fund set apart for some purpose. This fund belongs to an abstract society, and is held by someone in trust, usually a board of trustees. Examples: colleges, hospitals, and charitable associations.

A corporation may be dissolved by the death of all its members, or of such number as leaves not enough to make new elections in the way the charter requires; by forfeiture of the charter through breach of its conditions; by surrender of the charter. In all such cases the lands of the corporation revert to their several donors; the creditors, however, if any, being entitled in the first place to insist on a sale and distribution of the property, whether in a sequestration or otherwise.

Corporations, as has been pointed out in the American Civil Rights Act of Congress, are liable to the ordinary laws and treaties of the country, but are not citizens in the sense of exercising a political or municipal franchise. The American law has also had occasion to emphasize the distinction between public corporations which may be affected by legislation, while the written constitution of the U. S. prohibits any interference with the rights of a private corporation. Further, the franchises of a corporation are treated as realizable assets for creditors. The amount of property which may be held by a corporation is frequently limited in the act or charter; and as regards charitable and religious purposes, a general law forbids the holding of more than $50,000 worth.

The power of the majority to bind the society is one of the first principles of corporation law, even in cases where the corporation has a head. The binding majority is that of the number present at a corporate meeting duly summoned. Votes given for an illegal purpose or a disqualified person are considered as thrown away, and in an election votes must be given for some particular candidate—if they

are merely *against* a candidate, they are void. A corporation has power to make such regulations (by laws) as are necessary for carrying out its purposes, and these are binding on its members and on persons within its local jurisdiction if it has any. Such by-laws must not be at variance with the law of the land, nor retrospective in their operation, nor unreasonable. They must further be in harmony with the objects of the society, and must not infringe or limit the powers and duties of its officers.

Corpus'cular Theory of Light, the older theory, which explained the phenomena of light by supposing that a luminous body emits excessively minute particles of matter, corpuscles as they were called, which striking the eye produce the sensation of light. Newton held the corpuscular theory, and supported it with great ingenuity. This theory has long been displaced by the *undulatory theory.*

Correggio (kor-re-jō'), ANTONIO ALLEGRI, (1494–1534), famous Italian painter, b. at Correggio near Modena. Correggio is unrivaled in chiarooscuro and in the grace and rounding of his figures. Among his best pictures are *Night;* the *St. Jerome;* the *Marriage of St. Catharine;* several *Madonnas;* the *Penitent Magdalene;* the altar pieces of *St. Francis, St. George,* and *St. Sebastian.*

Correlation of Physical Forces, a term introduced by Grove to denote what may more properly be called the convertibility of the various forms of energy. The energy, for instance, which a bullet in rapid motion possesses, is converted into heat when it strikes the target, the bullet being then warm to the touch. So heat may again be converted into *kinetic energy,* that is, the form of energy possessed by a moving body; for instance, through the intermediation of a steam engine. Heat is also directly converted into electricity, and electricity into heat. In connection with this doctrine that of the conservation of energy ought also to be studied.

Corrèze (kor-rez), an inland department, France, formed from part of the former province of Limousin, and deriving its name from the river Corrèze, by which it is traversed. Area 2,265 sq. mi.; pop. 328,119.

Corrib, LOUGH, a lake in Ireland, mostly in Galway county, area 68 sq. mi.

Corrien'tes, a town, Argentine Republic, capital of the province of the same name. It is well placed to serve as an entrepôt of goods, between the upper parts of the Paraguay and the Parana, and the seaports on the La Plata. Pop. 14,200. Pop. of prov. 291,325; area 54,000 sq. mi.

Corrosive Sublimate, the bichloride of mercury, a white crystalline solid, an acrid poison of great virulence. The stomach pump and emetics are the surest preventives of its deleterious effects when accidentally swallowed; white of egg is also serviceable in counteracting its poisonous influence on the stomach. It is a powerful antiseptic.

Cor'rugated Iron, sheet iron strengthened by being bent into parallel furrows. It is largely used for roofing, and when dipped in melted zinc, to give it a thin coating, is commonly known as *galvanized iron.*

Corry, Erie co., Pa., 90 mi. s. of Buffalo. Railroads: Penna.; N. Y. L. E. & W.; N. Y. & P. Industries: iron mills, flouring mills, lumber, and sash and door factories. Natural gas, coal, and oil in vicinity. Surrounding country agricultural. Was first settled 75 years ago, but very thinly populated until the railroad was built. Pop. 1900, 5,369

Cor'sairs, the Anglicized form of the term used in the south of Europe to denote those pirates who sailed from Algiers, Tunis, Tripoli, and the ports of Morocco.

Cor'sica, an island in the Mediterranean, forming the French department of the same name. Area 3,377 sq. mi.; pop. 288,596. There are fine forests containing pines, oaks, beeches, chestnuts, and cork trees, and the mountain scenery is splendid. In the plains and numerous valleys the soil is generally fertile; but agriculture is in a backward state. Mules, goats, horses, cattle, and sheep, and among wild animals the boar, the fox, and the deer, are common. There are good fisheries. The chief exports are wine, brandy, olive oil, chestnuts, fruit, fish. The chief towns, Ajaccio and Bastia, are connected by railway. The island was first colonized by the Phœnicians, from whom it got the name of Cyrnos. The Romans afterward gave it that of Corsica. From the Romans it passed to the Goths, and from them to the Saracens, and in the fifteenth century to the Genoese. France had the rights of the Genoese ceded to her, after Paoli had virtually made Corsica independent, and entered on forcible possession of it in 1768. An insurrection in 1794, headed by General Paoli and assisted by the British, for a time restored the island to independence; but in 1796 it again fell under the dominion of France.

Corsicana, Navarre co., Tex., 54 mi. s. of Dallas. Railroads: Houston & Texas Central; and St. Louis Southwestern. Industries: two large oil mills, two cotton compresses, flouring mill, iron foundry, and numerous small factories. Coal, oil, and gas in vicinity. Surrounding country agricultural. The town was first settled in 1850 and became a city in 1875. Pop. 1900, 9,313.

Cort, HENRY (1740–1800), the inventor of the processes of puddling and rolling iron, b. at Lancaster.

Cortes (kor'tes), the legislative assembly of Spain and Portugal. See *Spain.*

Cor'tez (or Cortes), FERNANDO (or Hernan) (1485–1547), the conqueror of Mexico, was b. at Medellin, in Estremadura; d. near Seville. He went to the West Indies in 1504. He quitted Santiago de Cuba in 1518, with eleven vessels, about 700 Spaniards, eighteen horses, and ten small field pieces. He landed on the shore of the Gulf of Mexico, where he caused his vessels to be burned, in order that his soldiers might have no other resources than their own valor. After a desperate struggle, in which 100,000 natives are said to have perished, the

city was taken, and soon after the whole country was subjugated. In 1528 he returned to Spain; but two years after he was again sent out to Mexico, where he remained for ten years, discovering meanwhile the peninsula of California. He returned to Spain.

Cortland, Cortland co., N. Y., on Tioughnioga River, 37 mi. s. of Syracuse. Railroads: D. L. & W.; Lehigh Valley; and Erie & Central New York. Industries: wire mills, flouring mills, carriage, bicycle, skirt, chair, door, and window-screen factories, and several large wagon and sleigh factories. Surrounding country agricultural and mineral. The village was first settled in 1792, is the county seat of Cortland co. State normal and training school located here. Pop. 1900, 9,014.

Corun'dum, the earth alumina as found native in a crystalline state. In hardness it is next to the diamond. The amethyst, ruby, sapphire, and topaz are considered varieties of this mineral, which is found in India and China, and is most usually in the form of a six-sided prism or six-sided pyramid. It is nearly pure anhydrous alumina, and its specific gravity is nearly four times that of water. Its color is various—green, blue, or red inclining to gray, due to traces of iron, copper, etc. Emery is a variety of corundum.

Corun'na, a seaport of Spain in the province of the same name in Galicia. The harbor, which is well protected, is deep, spacious, and safe, and many improvements have been made. Cattle form the chief export. There is a government tobacco factory employing 3,000 women and girls. There is a lighthouse, 92 ft. high, called the Tower of Hercules, supposed to be of Roman construction. Pop. 37,251. The province is hilly, and its inhabitants chiefly engaged in agriculture and fishing. Area 3,079 sq. mi.; pop. 613,881.

Cor'vidæ, the crows, a family of conirostral birds, in which the bill is strong, of conical shape, more or less compressed, and the gape straight. The nostrils are covered with stiff bristle-like feathers directed forward. The family includes the common crow, rook, raven, magpie, jay, jackdaw, nut-cracker, Cornish chough, etc.

Corwin, Thomas (1794–1865), American statesman, b. in Bourbon co., Ky. In 1844 he was elected to the U. S. Senate. He was appointed by President Fillmore secretary of the treasury in 1850, and after his service here returned to the practise of law in Lebanon, O. In 1858 he was elected to Congress as a Republican, and was re-elected in 1860. President Lincoln appointed him minister to Mexico in 1861, but on the arrival of Maximilian he returned to Washington, and practised law.

Cor'ymb, in botany, that form of inflorescence in which the flowers, each on its own pedicel of different lengths, are so arranged along a common axis as to form a flat, broad mass of flowers with a convex or level top, as in the hawthorn and candytuft.

Cor'ypha, a genus of palms, including the fan palm, gebang palm, and taliput.

Coryphæ'na (Cor'yphene), a genus of fishes of the mackerel family. The body is elongated, compressed, covered with small scales, and the dorsal fin extends the whole length of the back, or nearly so.

Cos (now called Stanchio or Stanko), an island in the Ægæan Sea, on the coast of Asia Minor. Area 95 sq. mi.; pop. 11,000.

Cosenza (ko-sen'tsà), a city of Southern Italy, capital of province of Cosenza or Calabria Citeriore, 150 mi. s.e. Naples; pop. 15,149. It has manufactures of silk, pottery, and cutlery; the environs are beautiful, and produce abundance of corn, fruit, oil, wine, and silk.

Cosmog'ony (Greek, *kosmos*, world; and *gonē*, generation), a theory of the origin or formation of the universe. Such theories may be comprehended under three classes: 1, The first represents the world as eternal, in form as well as substance. 2, The matter of the world is eternal, but not its form. 3. The matter and form of the universe is ascribed to the direct agency of a spiritual cause; the world had a beginning, and shall have an end. Aristotle appears to have embraced the first theory; but the theory which considers the *matter* of the universe eternal, but not its *form*, was the prevailing one among the ancients, who starting from the principle that nothing could be made out of nothing, could not admit the creation of matter, yet did not believe that the world had been always in its present state. The prior state of the world, subject to a constant succession of uncertain movements which chance afterward made regular, they called *chaos*. The Phœnicians, Babylonians, and also Egyptians, seem to have adhered to this theory. One form of this theory is the atomic theory, as taught by Leucippus, Epicurus, and Lucretius. According to it atoms or indivisible particles existed from eternity, moving at hazard, and producing, by their constant meeting, a variety of substances. After having given rise to an immense variety of combinations they produced the present organization of bodies. The third theory of cosmogony makes God, or some deity, the creator of the world out of nothing. This is an ancient and widely spread theory, and is that taught in the book of Genesis. Anaxagoras was the first among the Greeks who taught that God created the universe from nothing. The Romans generally adopted this theory, notwithstanding the efforts of Lucretius to establish the doctrine of Epicurus.

Cosmos, order or harmony, and hence the universe as an orderly and beautiful system. In this sense it has been adopted by Humboldt as the title of his celebrated work, which describes the nature of the heavens as well as the physical phenomena of the earth.

Cos'sacks, tribes who inhabit the southern and eastern parts of Russia, paying no taxes, but performing instead the duty of soldiers. Writers are not agreed as to the origin of this people and of their name, but they are believed to be a mixed Caucasian and Tartar race. In personal appearance the Cossacks bear a close resemblance to the Russians. Originally their government formed a kind of

democracy, at the head of which was a chief or hetman of their own choice; while under him was a long series of officers with jurisdictions of greater or less extent, partly civil and partly military, all so arranged as to be able on any emergency to furnish the largest military array on the shortest notice. The democratical part of the constitution has gradually disappeared under Russian domination. The title of chief hetman is now vested in the heir apparent to the throne, and all the subordinate hetmans and other officers are appointed by the crown. Care, however, has been taken not to interfere with any arrangements which foster the military spirit of the Cossacks. Each Cossack is liable to military service from the age of eighteen to fifty, and is obliged to furnish his own horse. They furnish the empire with one of the most valuable elements in its national army, forming a first-rate irregular cavalry, and rendering excellent service as scouts and skirmishers. In 1570 they built their principal "stanitza" and rendezvous, called Tcherkask, on the Don, not far above its mouth. As it was rendered unhealthy by the overflowing of the island on which it stood, New Tcherkask was founded in 1805 some miles from the old city, to which nearly all the inhabitants removed. This forms the capital of the country of the Don Cossacks, which constitutes a government of Russia, and has an area of 61,900 sq. mi. and a pop. of 1,474,133. It has a military organization of its own.

Costa Rica, the most southern state of the republics of Central America; area 23,000 sq. mi., including some disputed territories on the northern frontier. The country is intersected diagonally by the primary range or cordillera of the isthmus, which throws off numerous spurs on either side. The principal range contains several lofty eminences and volcanoes. Costa Rica is said to contain some rich gold mines; at present, however, they are not worked to any great extent. Silver and copper are also found. The country is extremely fertile. Coffee, rice, maize, etc., are raised on the table-land in the interior; and cacao, vanilla, sugar, cotton, tobacco, etc., are cultivated in the low coast regions. Coffee forms the most important product. The forests are valuable. The capital is San José, and the two established ports are Punta Arenas, on the Pacific side, and Porto Limon, on the Caribbean Sea. It has been an independent state since 1821, from 1824 to 1839 forming a part of the Central American Confederation, but subsequently separate. Pop. 243,205, mostly of Spanish descent.

Coster, Laurens (1370–1440), whose name is connected with the origin of printing, was b. in Haarlem. According to a statement first found in Junius' Batavia (1588), he was the original inventor of movable types, and on this ground the Dutch have erected statues in his honor. But in 1870 a Dutchman, Van der Linde, professed to have demolished the claims of Haarlem to the invention of printing, and to have established that Holland, like other

countries, was indebted for it to the Mayence school. This conclusion has been rejected by J. H. Hessels, who, on carefully investigating the matter, thinks it highly probable that Coster was the inventor.

Côte-d'Or, an inland and eastern department of France, part of the old province of Burgundy, having Dijon as its capital. It is watered by the Seine, the Saône, and their affluents, and derives its name from the Côte-d'Or hills, which traverse it from n.e. to s.w. Area 3,382 sq. mi. The vineyards of the eastern slopes of the Côte-d'Or produce the celebrated wines of Upper Burgundy. Iron, coal, marble, etc., are found. Pop. 376,866.

Côtes-du-Nord (kot-dü-nor), a maritime department in the north of France, forming part of ancient Brittany; capital Brieuc. Area 2,659 sq. mi. The coast extends about 150 mi., and the herring, pilchard, and mackerel fishing is actively pursued. One of the main branches of industry is the rearing of cattle and horses. In manufacturing industries the principal branch is the spinning of flax and hemp, and the weaving of linen and sail cloth. Among the minerals are iron, lead, and granite. Pop. 618,652.

Cotopax'i, the most remarkable volcanic mountain of the Andes, in Ecuador, about 60 mi. n.e. of Chimborazo; altitude 19,500 ft. It is the most beautiful of the colossal summits of the Andes.

Cotta, Johann Friedrich, Baron von (1764–1832), an eminent bookseller of Germany.

Cotton, the name given to the soft cellular hairs which encircle the seeds of plants of the

Cotton (*Gossypium Barbadense*).—*a.*—ripe capsule after dehiscence; *b.*—seed; *c.*—the same deprived of its hairs.—(From Bentley & Trimen.)

genus *Gossypium*, nat. ord. Malvaceæ. The genus is indigenous to both the Old and the New World, and the plants are now cultivated all over the world within the limits of 30° north and south of the equator. All the species are perennial shrubs, though in cultivation they are sometimes treated as if they were annuals.

They have alternate stalked and lobed leaves, large, yellow flowers, and a three or five celled capsule, which bursts open when ripe through the middle of the cell, liberating the numerous black seeds covered with the beautiful filamentous cotton. The North American cotton is produced by *Gossypium barbadense*, and two well marked varieties are cultivated, the long-staple cotton, which has a fine, soft, silky fiber nearly 2 in. long, and the short-staple cotton, which has a fiber little over 1 in. long adhering closely to the seed. The long-staple variety known as Sea Island cotton holds the first place in the market. It is grown in some of the southern states and on islands bordering the coast. The cotton grown in South America is obtained from *G. peruviānum*, called also kidney cotton. The indigenous Indian species is *G. herbacĕum*, which yields a short-stapled cotton. It is grown throughout the Mediterranean region as well as in Asia. The mode of cultivation is usually as follows: The seeds are sown in the spring in drills of about a yard in width, the plant appearing above ground in about eight days afterward. The rows of young plants are then carefully weeded and hoed, a process which requires to be repeated at two or three subsequent periods. No hoeing takes place after the flowering has commenced, from which a period of seventy days generally elapses till the ripening of the seed. To prevent the luster of the cotton wool from being tarnished, the pods must not remain ungathered longer than eight days after coming to maturity. The cotton wool is collected by picking with the fingers the flakes from the pods, and then spreading out to dry, an operation which requires to be thoroughly performed. The cotton now comes to be separated from the seeds, a process formerly effected by manual labor, but which is now generally accomplished by machinery. After being cleansed from the seeds, the cotton wool is formed into bales, and is now ready for delivery to the manufacturer.

Cotton has been cultivated in India and the adjacent islands from time immemorial. It was known in Egypt in the sixth century before the Christian era, but was then probably imported from India. It was not till a comparatively late period that the nations of the West became acquainted with this useful commodity, and even then it appears only to have been used as an article of the greatest luxury. The introduction of the cotton shrub into Europe dates from the ninth century, and was first effected by the Spanish Moors, who planted it in the plains of Valencia. Cotton manufactories were shortly afterward established at Cordova, Granada, and Seville; and by the fourteenth century the cotton stuffs manufactured in the kingdom of Granada had come to be regarded as superior in quality to those of Syria. In China the cotton shrub was known at an early period, but it does not appear to have been turned to any account as an article of manufacture till the sixth century of the Christian era, nor was it extensively used for that purpose till nearly the middle of the fourteenth

Cotton

century. In the New World the manufacture of cotton cloth appears to have been well understood by the Mexicans and Peruvians long before the advent of Europeans. It was planted by the English colonists of Virginia in 1621, but only as an experiment, and the amount produced was long very small, the crop only amounting to about 2,000,000 lbs. in 1791. After this it rapidly increased, and in 1810 94,000,000 lbs. were exported. The quantity now produced is enormous, the crop of 1896 being estimated at 7,162,473 bales, averaging 440 lbs. each. The chief cotton-growing states are Mississippi, Georgia, Texas, Alabama, Arkansas, South Carolina, Louisiana, North Carolina, Tennessee, and Florida. The raw cotton exported in 1896 was 4,565,014 bales. In 1890 a process was discovered by which cotton can be manufactured from straw.

The cottons of commerce are usually distinguished by geographical names borrowed from the countries in which the article is produced, and under each of these divisions various qualities are recognized. The chief contributors to the European supply are the U. S., India, Egypt, and Brazil. There were in operation in the U. S. in 1894 16,811,000 spindles.

Cotton, Round Baling of. As opposed to the packing of cotton in a square box and its compression in bulk, a new system of baling has been introduced which is a combination process and admits of obtaining by one operation, on the plantation where the cotton is ginned, the same result that now calls for two operations at a considerably greater expense. As is well known the present system involves the formation on the plantation of the "country" bale, which has a density of twelve lbs. to the cubic foot. After which it is transported to shipping centers and compressed to a density of 22 to 26 lbs. per cu. ft. for final shipment. In the old method, the cotton was compressed in bulk and between the fiber and in the fibers themselves, a certain amount of air was also compressed. The result being that in case of fire the increased supply of oxygen in the center of the bale tended to increase combustion so that a fire among cotton bales consisted of their smoldering inside and being impervious to a deluge of water. The only way to stamp out such a fire was by the use of heavy gases which would not support combustion; this method being oftentimes called into service especially on shipboard, where a fire in a cotton-laden vessel is always a menace. The fact of this air being present in the square bale also produced a certain tendency to re-expansion, and heavy iron bands were employed to maintain the original volume of the bale. With the method of rolling up cotton, which we are describing, a wide sheet of loose cotton fiber, technically known as a *bat*, is wound up on a spindle between heavy compression rolls, and as this cotton winds up on itself into a roll of constantly increasing diameter, the effect is produced of excluding air from between layers of cotton. The mechanism is so arranged that the increasing size of the bale pushes back one of the two

rollers employed, giving a constantly increasing resistance to the increasing size of the bale. The machine in this way is automatic, furnishing its own pressure and being driven by belt power at an expenditure of energy no greater than was formerly used on the plantation on the old-time country bale of twelve lbs. density, and with this equipment just described a density of 38 to 40 lbs. is easily obtained, and curiously enough a bale is produced that has no tendency to re-expansion and needs no bands of any kind to hold it in shape. It has a density greater than some woods and is incombustible. Insurance inspectors have maintained bonfires around these bales and have demonstrated beyond a question that it is impossible to make such a bale support combustion. The air is expelled between each layer of cotton so that the center of the bale is without oxygen. Another feature of the round bale that makes it noticeable is the ease with which it is opened up and handled by the mills. The cotton unrolls in a strong tough sheet that is fed into the pickers which forms the first operation in cotton mill work. The bale while comparatively new on the market is coming rapidly to the front, and has demonstrated its place on the market and the fact that it is a distinct advance in the ease of handling the principal staple of the world.

Cotton Famine, the destitution in England caused by the outbreak of the American Civil War (1861–65) in the English cotton manufacturing districts, especially in Lancashire. The cotton supply failed on account of the blockade of the southern ports of the U. S., and in consequence the mill owners finally closed their mills entirely—nearly two millions of people being reduced to great distress.

Cotton-seed Oil, a valuable oil expressed from the seeds of the cotton plant, used as an adulterant or as a substitute for various other oils. The oil cake of cotton seed is a valuable cattle-feeding substance.

Cotton-spinning, a term employed to describe in the aggregate all the operations involved in transforming raw cotton into yarn. The word "spinning" has also a more limited signification, being used to denote the concluding process of the series. The following affords a general notion of the nature and order of the successive operations carried on in the manufacture of cotton yarn: 1, *Mixing*, the blending of different varieties of raw cotton, in order to secure economical production, uniform quality and color, and an even thread in any desired degree. 2, The *willowing*, *scratching*, or *blowing*, an operation which cleans the cotton and prepares it in the form of a continuous lap or rolled sheet for the next process. 3, *Carding*, an operation in which the material is treated in its individual fibers, which are taken from the lap, further cleansed, and laid in a position approximately parallel to each other, forming a thin film, which is afterward condensed into a sliver—a round, untwisted strand of cotton. 4, *Drawing*, the drawing out of several slivers to the dimensions of one so as to render the new sliver more uniform in thickness, and to place the fibers more perfectly in parallel order. 5, *Slubbing*, the further drawing or attenuation of the sliver, and slightly twisting it in order to preserve its cohesion and rounded form. 6, *Intermediate* or *second slubbing*, a repetition of the former operation and further attenuation, not necessary in the production of coarse yarns. 7, *Roving*, a continuation of the preceding, its principal object being to still further attenuate the sliver, and give it a slight additional twist. 8, *Spinning*, which completes the extension and twisting of the yarn. This is accomplished either with the throstle or the mule. By means of the former machine the yarn receives a hard twist, which renders it tough and strong. By means of the latter yarns of less strength are produced, such as warps of light fabrics and wefts of all kinds. Up to the middle of the last century the only method of spinning known was that by the hand-wheel, or the still more primitive distaff and spindle. In 1767 a poor weaver of the name of Hargreaves, residing at Stanhill, near Blackburn, in Lancashire, invented a machine for spinning cotton, which he named a *spinning-jenny*. It consisted at first of eight spindles, turned by a horizontal wheel, but was afterward greatly extended and improved, so as to have the vertical substituted for the horizontal wheel, and give motion to from 50 to 80 spindles. In 1769 Arkwright, originally a barber's apprentice, took out a patent for spinning by rollers. From the circumstances of the mill erected by Arkwright being driven by water-power, his machine received the name of the *water-frame*, and the thread spun on it that of *water-twist*. The next important invention in cotton-spinning was that of the *mule*, introduced by Samuel Crompton, of Bolton, in 1775, and so called from its combining the principle of the spinning-jenny of Hargreaves with the roller-spinning of Arkwright. Numerous improvements in cotton-spinning have been subsequently introduced up to the present day, but they are all, more or less, modifications of Arkwright's spinning-frame and Crompton's mule-jenny. Among the principal of these may be mentioned the *throstle*, an extension and simplification of the original spinning-frame, introduced about the year 1810. The first machines set up in the U. S. were at East Bridgewater, Mass., in 1786, by two Scotchmen. In 1812 Francis C. Lowell introduced the Cartwright power-loom at Lowell, Mass., which is now the largest cotton manufacturing center in America.

Couch (Quitch, or Quick) **Grass,** a perennial grass, which is propagated both by seed and by its creeping root-stock, and is one of the most common and troublesome weeds of agriculture.

Cougar (kö'gär), a voracious quadruped of the cat kind, inhabiting most parts of America. Its color is a uniform fawn, or reddish brown, without spots or markings of any kind. It may attain a length of 9 ft., inclusive of the tail. In habits it is stealthy and cowardly, and seldom or never attacks man. It is by

some called the puma or red tiger, and is one of the most destructive of all the animals of America, particularly in the warmer climates, where it carries off fowls, dogs, cats, and other domestic animals.

Coulomb (kö-lon), CHARLES AUGUSTIN DE (1736–1806), French physicist. His fame rests chiefly on his discoveries in electricity and magnetism, and on his invention of the torsion balance.

Council Bluffs, Pottawattomie co., Ia., on Missouri River, 500 mi. s. w. of Chicago. Railroads: C. B. & Q.; C. R. I. & P.; Wabash; Northwestern; and C. M. & St. P. Industries: iron works, candy factory, and others. The town was first settled in 1840. The name is derived from a council held here with the Indians in 1804. Pop. 1900, 25,802.

Coun'terpoint, in music, a term equivalent to harmony, or the writing of a carefully planned accompanying part; or that branch of the art which, a musical thought being given, teaches the development of it, by extension or embellishment, by transposition, repetition, or imitation throughout the different parts. Counterpoint is divided into *simple*, *florid*, or *figurate*, and *double*. *Simple counterpoint* is a composition in two or more parts, the notes of each part being equal in value to those of the corresponding part or parts and concords. In *florid counterpoint*, two or more notes are written against each note of the subject, or *canto-fermo*, and discords are admissible. *Double counterpoint* is an inversion of the parts, so that the base may become the subject, and the subject the base, etc., thus producing new melodies and new harmonies.

Coun'tersign, a private signal, word, or phrase given to soldiers on guard, with orders to let no man pass unless he first give that sign; a military watchword.

County, originally a district of a country subject to a *count* or earl. It is now a civil district corresponding with shire in England and Scotland.

Couple, in dynamics, two equal and parallel forces acting in different directions, and applied to the same body. The distance between their lines of action is called the *arm* of the couple, and the product of one of the two equal forces by this arm is called the moment of the couple.

Coupling, in machinery, a contrivance for connecting one portion of a system of shafting with another, and of which there are various forms. A common form is the flange or plate coupling, which consists of two flanges separately fitted onto the two contiguous ends of the lengths of shaft to be connected, and firmly secured together by screws. The most useful kinds of couplings are those that are adjustable, or can be readily put on and off. The term is also applied to an organ register, by which two or more rows of keys can be connected by a mechanism, so that they can be played together.

Coupon (kö'poṇ), an interest-certificate printed at the bottom of transferable bonds, and so called because it is cut off or detached and given up when a payment is made. Also one of a series of tickets which binds the issuer to make certain payments, perform some service, or give value for certain amounts at different periods, in consideration of money received.

Courbevoie (körb-vwä) a town of France, department Seine, on the left bank of the Seine, 5 mi. n.w. of Paris, well built, with large barracks. Pop. 17,597.

Courcelles (kor-sal'), a village of Alsace-Lorraine, 4 mi. s.e. of Metz; scene of a German victory over the French under Bazaine, Aug. 14, 1870.

Courland, a government in Russia, area 10,535 sq. mi. Pop. 693,300.

Courser (or Courier), a genus of grallatorial birds belonging to the plover tribe. They are found chiefly in Africa.

Court Martial, a court consisting of military or naval officers, for the trial of military or naval offenses. In the army of the U. S. there are general courts martial, before which only officers can be tried, and regimental and garrison courts martial. In the navy, summary courts martial are held for the trial of petty officers and persons of inferior rating, and general courts martial for the trial of the higher officers.

Courtplaster (so called because originally applied by ladies of the court as patches on the face), black, flesh-colored, or transparent silk varnished over with a solution of isinglass, which is often perfumed with benzoin, used for covering slight wounds.

Courtrai (kör-trā), a fortified town, Belgium, province of West Flanders, 26 mi. s. of Bruges, on the Lys. Its manufactures are table linens, lace, cambrics, cotton goods, etc., and it has extensive bleaching and dyeing works. Pop. 31,319.

Cousin (köusaṇ), VICTOR (1792–1867), French philosopher and writer, founder of the so-called Eclectic school of philosophy. He was educated at the Lycée Charlemagne. In 1815 he became deputy professor of philosophy at the Sorbonne. He had also an appointment at the Lycée Napoléon, or Collége Henri IV, and at the Ecole Normale. In 1817 he visited Germany. He lost his position as public teacher on political grounds in 1822, and did not resume teaching till 1828, when he shared with Guizot and Villemain an unexampled popularity, due partly to political feeling. In the cabinet of Thiers in 1840 he accepted the office of minister of public instruction, and was created a peer of France. The revolution of 1848 brought his public career to a close. The head and founder of the modern school of eclecticism in France, he borrowed from many sources. His eclecticism was based on the principle that every system, however erroneous, which has anywhere commanded assent, contains some elements of truth, by which its acceptance may be explained, and that it is the business of philosophical criticism to discover and combine these scattered elements of truth.

Cousins, SAMUEL (1801–1887), English en-

graver. He engraved plates after Lawrence, Landseer, Reynolds, Millais, Leslie, Eastlake, Ward, etc. He was elected a Royal Academician Engraver in 1855, and when this class was abolished he became an Academician proper.

Couthon (kö-tōn), GEORGES (1756–1794), a French revolutionist. Some time after the Revolution he was chosen a member of the national assembly. On the downfall of Robespierre's party Couthon shared, along with him and St. Just, in the decree of arrest, and was guillotined.

Covenant, in law an agreement between two or more parties in writing signed, sealed, and delivered, whereby they agree to do, or not to do, some specified act. In theology, the promises of God as revealed in the Scriptures, conditional on certain terms on the part of man, as obedience, repentance, faith, etc.

Covent Garden, a market place in London, England, which formerly consisted of the garden belonging to the abbot and monks of Westminster. In 1831 the present market buildings were erected by the Duke of Bedford, the proprietor of the ground.

Cov'entry, a city in England, county of Warwick, 85 mi. n.w. of London. Parliaments were convened here by the earlier monarchs of England, several of whom occasionally resided in the place. Pageants and processions were celebrated in old times with great magnificence, and a remnant of these still exists in the processional show in honor of Lady Godiva. Coventry is the center of the ribbon trade. Pop. 54,755.

Cov'erture, a legal term applied to the position of a woman during marriage, because she is under the cover or protection of her husband.

Covington, Kenton co., Ky., on Ohio River opposite Cincinnati, with which it is connected by a suspension bridge over the river. Surrounding country agricultural. Railroads: Kentucky Central, and Chesapeake & Ohio. Principal industries are cigar and tobacco factories, carriage and wagon works, distilleries, breweries, flour mills, etc. There are also several pork-packing houses, glass works, and silk manufactories. Pop. census 1900, 42,938.

Cow, the general term applied to the females of the genus *Bos* or ox, the most valuable to man of all the ruminating animals. Among the best breeds of dairy cows are the Devonshire, the Ayrshire, the short-horn, the polled Angus or Aberdeenshire, and the Alderney.

Cowberry, red whortleberry, a procumbent shrub of high moorlands in Europe, Asia, and North America, has evergreen, box-like leaves, and produces a red acid berry used for jellies and preserves.

Cow Bunting, an American bird belonging to the family Sturnidæ, or starlings. It drops its eggs into the nests of other birds to be hatched by them, but has never been known to drop more than one egg into the same nest. It is migratory, spending its winters regularly in the lower parts of North and South Carolina and Georgia, and appearing in Pennsylvania

about the end of March. These birds often frequent corn and rice fields in company with the red-winged troopials, but are more commonly found accompanying the cattle, feeding on seeds, worms, etc.

Cow'itch (or cowhage), the hairs of the pods of leguminous plants, genus *Mucūna*, natives of the East and West Indies. The pod is covered with a thick coating of short, stiff, brittle, brown hairs, the points of which are finely serrated. They easily penetrate the skin, and produce an intolerable itching. They are employed medicinally (being taken in honey or syrup) as a mechanical vermifuge.

Cowley (kau'li), ABRAHAM (1618–1667), an English poet of great celebrity in his day b. in London. He was educated at St. John's College, Oxford. He engaged actively in the royal cause, and when the queen was obliged to quit England, Cowley accompanied her. He was absent from his native country nearly ten years, and it was principally through him that the correspondence was maintained between the king and queen. He took a considerable interest in science, and was one of the founders of the Royal Society.

Cowloon' (or Kowloon), a peninsula at the mouth of the Canton River, directly opposite to the island of Hong-Kong, to which crown colony it belongs.

Cow Parsnip, an umbelliferous plant, one species of which, found in moist woods and meadows, grows to the height of 4 or 5 ft., and is used to feed pigs. Siberian cow parsnip is grown in gardens and shrubberies, reaching the height of 10 or 12 ft.

Cowpea (Cow-grass), a variety of clover cultivated in England and some parts of the U. S. for the same purpose as the common red.

Cowper (kö'pėr, or kou'pėr) WILLIAM (1731–1800), English poet. He was the son of a clergyman; lost his mother at the age of six, and was, when ten years of age, removed from a country school to that of Westminster, which he left at eighteen with a fair reputation for classical learning, and a horror of the school discipline, which he afterward expressed in his *Tirocinium.* He was then articled for three years to a solicitor, where he had for a fellow clerk Mr., afterward Lord, Thurlow. At the expiration of his apprenticeship he took chambers in the Middle Temple, and in 1754 was called to the bar. The interest of his family procured for him the post of clerk to the House of Lords; but having to appear for examination at the bar of the house, his nervousness was such that on the very day appointed for the examination he resigned the office, and soon after became insane. From December, 1763, to June, 1765, he remained under the care of Doctor Cotton at St. Albans. The skill and humanity of that gentleman restored him to health, and he retired to Huntingdon. In 1776 he commenced a poem on the *Progress of Error*, which he followed by three other poems, *Truth*, *Table Talk*, and *Expostulation;* these with some others were published in a volume in 1782. One of his friends, Lady Austen, suggested the *Task*, which, together with *Tirocinium*,

formed a second volume in 1785. *The History of John Gilpin* is also due to the suggestion of Lady Austen. The translation of *Homer*, begun in 1784, occupied him for the next six years, and was published in 1791. He removed during its progress, in 1786, from Olney to Weston. In the beginning of 1794 he was again attacked with madness. The revisal of his *Homer*, and the composition of some short pieces, occupied the latter years of his life.

Cowpox, the vaccine disease which appears on the teats of the cow, in the form of vesicles of a blue color, approaching to livid. These vesicles are elevated at the margin and depressed at the center; they are surrounded with inflammation and contain a limpid fluid. This fluid or virus is capable of communicating genuine cowpox to the human subject, and of protecting against smallpox either completely, or, at least, against the virulent form of the disease.

Cowrie shell, a small gasteropodous shell, used for coin in some parts of Africa and in many parts of Southern Asia. The beauty of the cowrie shells has procured them a place among ornaments, and they have been in demand among civilized and uncivilized nations time out of memory. The shells used as currency occur principally in the Philippine Islands. They vary in value in different localities. In India 6,000 to 7,000 are equal to a rupee, while in the interior of Africa 200 are worth 16 cents.

Cow'slip, a fragrant and pretty wild flower found in pastures and meadows. It has umbels of small, buff-yellow, scented flowers on short pedicels. Its flowers possess sedative properties, and have been used as an anodyne, a sort of wine being prepared from them.

Cow trees, a name of various trees having an abundance of milky juice, especially of a South American tree, which, when wounded, yields a rich milky nutritious juice in such abundance as to render it an important article of food. This fluid resembles in appearance and quality the milk of the cow. The tree is common in Venezuela, growing to the height of 100 ft. The leaves are leathery, about 1 ft. long and 3 or 4 inches broad.

Cox, David (1783–1859), an English landscape painter, b. in Birmingham. His works are chiefly of English landscape, and in water colors, a department which constituted his peculiar walk. His pictures are now very highly valued.

Cox, Samuel Sullivan (1824–1889), statesman, b. in Zanesville, O. He removed to New York City in 1866, and two years later was elected to Congress from that city and served until 1882. In 1885 he was appointed minister to Turkey, resigned the following year, and in November, 1886, again became congressman.

Coxey, Jacob S., American labor agitator, b. in Pennsylvania in 1854. Early in life he speculated in sandstone quarries at Massilon, O., and later became a horse breeder and owned a stock farm in Kentucky. In politics he was formerly a Greenbacker, but became a Populist and was a delegate to the St. Louis convention in 1896. Coxey advocated the issue of $500,000,000 in bonds by the Federal government to be expended in the construction of good roads, thus giving employment to men out of work. To promote this scheme he led an army of 336 men, known as the Commonweal army, to Washington in 1894. In Washington he attempted to conduct a demonstration on the steps of the capitol and in so doing, trespassed upon the grass. He was arrested and lodged in jail. He was a candidate for Congress in Ohio in 1896.

Coyote (koi-ōt', koi-o'tā), the American prairie wolf, is intermediate in size between the fox and the ordinary wolf. It is the American representative of the old world jackal. It is 36 to 40 in. long with a tail of 16 to 18 in. The voice is a kind of snapping bark, whence the name of barking wolf.

Coyote.

Crab, a popular name for all the ten-footed, short-tailed crustaceans constituting the suborder Brachyura, order Decapoda, comprising many genera, distinguished from the lobster and other macrurous or long-tailed decapods by the shortness of their tail, which is folded under the body. The head and breast are united, forming the cephalothorax, and the whole is covered with a strong carapace. The mouth has several pairs of strong jaws, in addition to which the stomach has its internal surface studded with hard projections for the purpose of grinding the food. The stomach is popularly called the "sand-bag;" a little behind it is the heart, which propels a colorless lymph (the blood) to the gills ("dead man's fingers"). The liver is the soft, rich, yellow substance, usually called the *fat* of the crab.

Great Crab.

They "molt" or throw off their calcareous covering periodically. The first pair of limbs are not used for locomotion, but are furnished with strong claws or pincers. Their eyes are compound, with hexagonal facets, and are pedunculated, elongated, and movable. Like most individuals of the class, they easily lose their claws, which are as readily renewed. They generally live on decaying animal matter, though others live on vegetable substances, as the racer crabs of the West Indies, which suck the juice of the sugar cane. Most inhabit the sea, others fresh water, some the land, only going to the sea to spawn. Of the crabs, several species are highly esteemed as an article of food, and the fishery constitutes an important trade on many coasts.

Crabbe (krab), GEORGE (1754–1832), an English poet. His poems are all characterized by homely truthfulness, simplicity, and pathos.

Cracow', the old capital of Poland, in 1815–46 capital of a republic of the same name now forming part of Austrian Galicia, is situated on the left bank of the Vistula, where it becomes navigable, and consists of Cracow proper or the old city, and several suburbs. The c' edral, a fine old Gothic edifice, contains uments of many Polish kings, of Kosciusko, etc. It has a library of 300,000 volumes. On a hill near the town stands the monument of Kosciusko, 120 ft. high. Pop. 72,472.

Crambe, a genus of cruciferous plants, natives of Europe and Asia. They are perennial herbs, with stout branched stems and broad leaves.

Cranberry, the fruit, a native of Northern

Cranberry.
a.— flower; *b.*— fruit.

Asia, Europe, and North America. It is also called *Moss-berry* or *Moor-berry*, as it grows only on peat-bogs or swampy land, usually among masses of sphagnum. The berry, when ripe, is globose and dark red, and a little more than ¼ in. in diameter. These berries form a sauce of exquisite flavor, and are used for tarts. The American cranberry, a native of U. S. and Canada, is the *O. macrocarpus*. It has larger berries than the European species, and is extensively cultivated in some localities.

Crane, the common name of birds of the

genus *Grus*, order Grallæ, or Gralatores. They are generally of considerable size, and remarkable for their long necks and stilt-like legs, which eminently fit them for living in marshes and situations subject to inundations, where they usually seek their food. This is partly of vegetable matter, but they also devour insects, worms, frogs, lizards, reptiles, small fish, and the spawn of various aquatic animals. They build their nests among bushes or upon tussocks in marshes, and lay but two eggs. Cranes annually migrate to distant regions, and perform voyages astonishing for their great length. The common crane has the general plumage ash-gray, the throat black, the rump ornamented with long, stiff, and curled feathers, the head with bristly feathers;

Crane.

legs black; length about 4 ft. It inhabits Europe, Asia, and the north of Africa. The crowned crane has the general plumage bluish ash-gray, the tail and primary quills black, the wing coverts pure white; the head is crowned with a tuft of slender yellow feathers, which can be spread out at pleasure. It inhabits North and West Africa. The demoiselle crane is so called from the elegance of its form. It is ash-gray, and the head is adorned with two tufts of feathers formed by a prolongation of the ear coverts. Its habitat is Africa and the south of Europe. Among North American species are the whooping crane, a larger species than the common crane, and the brown or sandhill crane.

Crane, a machine for raising great weights and depositing them at some distance from their original place, for example, raising bales from the hold of a ship and depositing them on the quay. Cranes are generally constructed on the principle of the wheel and axle, cog-wheel, or wheel and pinion. A very efficient wheel and pinion crane much used on quays consists of a jib or transverse beam, inclined to the vertical at an angle of from 40° to 50°, which, by means of a collar, turns on a vertical shaft. The upper end of the jib carries a fixed pulley, and the lower end a cylinder, which is put in motion by a wheel and pinion. The weight is made fast to a rope or chain which passes over the pulley and is wound round the

cylinder. On turning the cylinder the weight is raised as far as necessary. The jib is then turned on its arbor till the weight is brought immediately over the spot where it is to be deposited, and the moving power is withdrawn so as to allow the weight to descend by its own gravity.

Crane, STEPHEN, novelist, was b. in New York in 1872. He studied at Syracuse University and Lafayette College, and at the age of 16 began newspaper work. While thus engaged he wrote and published at his own expense, *Maggie, a Girl of the Streets*, a realistic novel of street and slum life. *The Red Badge of Courage*, which eventually came into notoriety, was written before the author obtained his majority. The story deals with a raw recruit in battle from his first fear on confronting the foe and nearing the whistle of shot and shell, and is told in a most vivid manner. He was able to describe the battle scenes and tactical evolutions in such a way as to deceive the critics, who declared that such descriptions could only have been written by an old veteran. Died June 5, 1900.

Cran'mer, THOMAS (1489–1556), archbishop of Canterbury, and famous for the part he played in the English reformation during the reign of Henry VIII, was b. at Aslocton, Notts. In January, 1533, he was appointed archbishop of Canterbury. He zealously promoted the cause of the Reformation; and through his means the Bible was translated and read in churches, and monastic institutions were vigorously suppressed. Henry VIII appointed him by will one of the Council of Regency to Edward VI. The exclusion of the Princess Mary from the crown, by the will of her brother, was a measure in which Cranmer joined the partisans of Lady Jane Grey. With others who had been most active in Lady Jane's favor he was sent to the Tower on the accession of Mary. He was tried on charges of blasphemy, perjury, incontinence, and heresy, and was sentenced to be degraded and deprived of office. Shortly afterward he was burned at the stake.

Crape, a light transparent stuff, like gauze, made of raw silk, gummed and twisted on the mill, woven without crossing, and much used in mourning.

Cra'shaw, RICHARD (1613–1649), an English poet. He displayed considerable poetic genius in the treatment of religious subjects, and though his works are almost forgotten they are said to have furnished hints to both Milton and Pope.

Crassus, MARCUS LICINIUS (B.C. 115–53), the Roman triumvir, surnamed *Dives* (the rich), on account of his vast riches. He took part with Sulla in the civil war; and as prætor, in B.C. 71, he defeated Spartacus and the revolted slaves at Rhegium. In B. C. 70 he was elected consul, having Pompey as his colleague; and in B.C. 60 Cæsar, Pompey, and Crassus formed the first triumvirate. Five years later he again became consul, and obtaining Syria for his province he made war on the Parthians, but was defeated and slain.

Crater, the orifice or mouth of a volcano. Craters may be central or lateral, and there may be several subsidiary ones, which may shift their places, or become merged by subsidence into others.

Crati'nus, an Athenian comic poet to whom the invention of satirical comedy is attributed; d. B. C. 422. Some fragments of his works remain.

Cravat', a neckcloth; an article of silk, muslin, or other material worn by men about the neck; so called from Fr. *Cravate*, a Croat, because this piece of dress was adopted in the seventeenth century from the Croats who entered the French service. Toward the end of the eighteenth and the beginning of the nineteenth century, the cravat attained an incredible degree of extravagance, but common sense at last brought in the simpler style of neckties that has since prevailed.

Crawfish.

Crawfish (or Crayfish), a name of various crustaceous animals, the common crawfish, the river lobster, a macrurous, ten-footed crustacean, resembling the lobster in appearance and habits. It inhabits the fresh waters of the U. S., Europe, and the north of Asia, and is common in some of the streams of England. It lurks under stones or in holes in the banks. Its food consists of small mollusks or fishes, the larvæ of insects, and almost any sort of animal matter. Some of them by their burrowing habits injure mill-dams and the levees of the Mississippi.

Crawfordsville, Montgomery co., Ind., on Sugar Creek. Railroads: Big Four, Vandalia, and Monon. Industries: wire fence, flour mill, iron foundry, woolen mill, and other small factories. Surrounding country agricultural. The town was first settled in 1823, and became a city in 1865. Pop. 1900, 6,649.

Crawford, FRANCIS MARION, novelist, son of Thomas C., was b. in Tuscany, Aug. 2, 1854. He had his education at Concord, New Hampshire; Trinity College, Cambridge; Karlsruhe, and Heidelberg. At Rome he devoted himself to the study of Sanskrit, and during 1879–80 was engaged in press work at Allahabad, where he was admitted to the Catholic Church. He was selected by the government committee to write the national ode at the centennial of the American Constitution, Sept. 17, 1887. His first novel, *Mr. Isaacs* (1882), was a book of striking and quite unusual merit, and at once

found its author an audience. The rich romantic elements in certain of the aspects and contrasts of modern Oriental life was a distinct discovery to worked-out novelists. Its successors have been *Dr. Claudius*, and *To Leeward* (1883); *A Roman Singer*, and *An American Politician* (1884); *Zoroaster* (1885); *The Story of a Lonely Parish*, and *Saracinesca* (1886); *Marzio's Crucifix*, and *Paul Patoff* (1887); *With the Immortals* (1888); and *Sant' Ilario* (1889). Mr. Crawford possesses imagination, originality, and direct vigor, with a graceful and vivid style, and remarkable power of description.

Crawford, THOMAS (1814–1857), sculptor. His most famous works comprise *Orpheus and Cerberus*, *Adam and Eve*, *Hebe and Ganymede*, *Mercury and Psyche*, and *Dancing Jenny*. He performed important works for the National Government and state of Virginia.

Crawford, WILLIAM HARRIS (1772–1834), American statesman, b. in Nelson co., Va. He was admitted to the bar in 1798. In 1800 he was appointed with Horatio Marbury to revise the laws of Georgia. He was elected to the legislature in 1802, and in 1806 to the U. S. Senate. In 1813 he declined the office of secretary of war in President Madison's cabinet, and was appointed minister to France. He returned to this country in 1815, and was made secretary of the treasury, serving through both terms of Monroe's administration. He was made judge of the northern circuit of Georgia in 1827, which office he held until the time of his death.

Cray'ons, colored pencils obtained from certain mineral substances in their natural state, but more commonly manufactured from a fine paste of chalk or pipe-clay colored with various pigments, and consolidated by means of gum, wax, etc. A kind of *crayon painting* is practised to some extent, the coloring matter in a soft state being rubbed on with the finger. Its chief advantages consist in the great facility of its execution, and the soft beauty and richness of coloring of effects so easily produced. The paper used has a specially granulated surface.

Cream of Tartar (or Potassium Bitartrate) exists in grapes, tamarinds, and other foods. It is prepared from the crystalline crust, deposited on the vessels in which grape juice has been fermented. The argol is dissolved by boiling with water, the mixture filtered, and the cream of tartar allowed to crystallize out. The commercial product usually contains a small percentage of calcium tartrate. It is frequently employed in medicine for its diuretic, cathartic, and refrigerant properties; as a mordant in dyeing wool; and as an ingredient in baking powder.

Creasy (kre'si), SIR EDWARD SHEPHERD (1812–1878), English historian. In 1840 he was appointed professor of history at the London University, and in 1860 was made chief justice of Ceylon, receiving at the same time the honor of knighthood. His principal works are: *The Rise and Progress of the British Constitution*, and *The Fifteen Decisive Battles of the World*.

Crécy (or Cressy), a small town of France,

in the department of Somme, 100 mi. n. of Paris; pop. 1,748. It is celebrated on account of a battle fought here, Aug. 26, 1346, between the English and French.

Cred'it, in economics, is the postponement agreed on by the parties of the payment of a debt to a future day. It implies confidence of the creditor in the debtor; and a "credit system" is one of general confidence of people in each other's honesty, solvency, and resources. By means of a credit system a comparatively small stock of money can be made to do duty for carrying on a number of different transactions; but it is indispensable for every good system of credit that money must be instantly available when required, and this principle applies to every species of transaction where postponed payment is concerned. Public credit is the confidence which men entertain in the ability and disposition of a nation to make good its engagements with its creditors; or the estimation in which individuals hold the public promises of payment, whether such promises are expressed or implied. The term is also applied to the general credit of individuals in a nation; when merchants and others are wealthy and punctual in fulfilling engagements; or when they transact business with honor and fidelity; or when transfers of property are made with ease. So we speak of the credit of a bank when general confidence is placed in its ability to redeem its notes, and the credit of a mercantile house rests on its supposed ability and probity, which induce men to trust to its engagements. When the public credit is questionable it raises the premium on loans.

Credit, LETTER OF, an order given by bankers or others at one place to enable a person to receive money from their agents at another place.

Credit Mobilier.—In 1852 the French government sanctioned the statutes of a new bank under the name of the *Société Générale de Crédit Mobilier*. The Credit Mobilier proposed to give aid to the owners of *movable* property. The declared object of this bank is especially to promote industrial enterprises of all kinds, such as the construction of railways, sinking of mines, etc. It was allowed to acquire shares in public companies, and to pay the calls made upon it in respect of such shares, by its own obligations (or bonds); also to sell or give in security all shares thus acquired. The operations of the society were conducted upon a very extensive scale.. In 1854 it subscribed largely to the government loan on account of the Russian War, to the Grand Central Railway Company, to the General Omnibus Company of Paris, and to various other important undertakings. The dividend for this year was 12 per cent. In 1855 it loaned two sums to the government—the one of 250 and the other 375 million francs. Its operations were vast during this year, and the dividends declared amounted to 40 per cent. The public became alarmed so that, in 1856, the French government deemed it necessary to prohibit the carrying out of the proposed scheme.

This was a severe blow to the institution. In 1856 its dividends did not exceed 22 per cent.; in 1857 they were only 5 per cent. Several attempts had been made to resuscitate its credit, but failed. On Nov. 12, 1871, it was reorganized, the assets of the first society being reported at 48 million francs. In 1878 the capital was reduced from 80 millions to 32, and in 1879 raised again to 40 millions. Another reduction was made in 1884—30 million francs.

The title "Crédit Mobilier of America" was adopted by a joint stock company organized in 1863, with a capital of $2,500,000. In 1867 the charter having been purchased by a company organized for the construction of the Union Pacific railroad, the stock was increased to $37,500,000, and afterward rose to a great value, paying enormous dividends. In 1872 it became known that several members of Congress, as well as the vice president, were more or less secret stockholders. This caused a great political scandal, and led to a congressional investigation, which developed a huge attempt at bribery and corruption. An appeal was made to Congress for legislation to assist in the consummation of the work. In the course of debate it was charged that several leading advocates of the plan had been bribed by donations of large blocks of shares in return for their influence—among the culprits being the vice president of the U. S., and several senators and congressmen. As a result, resolutions of censure were passed in Congress in respect of one or more of its members, and one gentleman was sentenced to expulsion, but the sentence was never carried out. The scandal, after a time, died away, and the road proposed was finally built and is now in operation.

Creed, a summary of belief. The Nicene Creed was so called from being adopted as the creed of the church at the council of Nicæa or Nice, 325 A.D., though its terms were subsequently somewhat altered. The Apostles' Creed probably dates from the end of the fourth century; but there is no evidence of its having been accepted in its present form till the middle of the eighth. The Athanasian Creed was certainly not drawn up by St. Athanasius, as there is not sufficient evidence for its existence before the end of the eighth or beginning of the ninth century. In addition to these three creeds, the R. C. Church has the creed of Pius IV, put forth in 1564, and consisting of the Nicene Creed with additional articles adopted by the Council of Trent, to which is now added a profession of belief in the definitions of the Vatican Council. The Protestant Church adopts as "thoroughly to be received and believed" the three ancient creeds, which as part of her liturgy may be read in the *Book of Common Prayer*, but does not consider any of them to be inspired. The *Thirty-nine Articles* of the *Book of Common Prayer* form a confession of faith for the Anglican Church. The creed of the Church of Scotland, and other Presbyterian churches, is contained in the *Confession of Faith*, drawn up by the Westminster Assembly of Divines, and completed in 1646.

Creedmoor, a station on the Long Island railway, 11 mi. e. of the city of New York. It is much frequented by riflemen for target practise.

Creeks, American Indians formerly in Georgia and Alabama, but now planted in the Indian Territory. The number of warriors used to amount to about 6,000, but altogether the tribe does not now exceed 9,300. They have made considerable progress in agriculture, and raise horses, cattle, fowls, and hogs, and cultivate tobacco, rice, and corn.

Creepers, a family of birds which strongly resemble the woodpeckers in their habit of creeping on the stems of trees with the aid of

Common Creeper.

the strong quills which project from the tail feathers, and of securing their insect food by an exsertile tongue. The common creeper is European, but is represented by American species. It builds its nest usually in holes or crevices of trees. The wall creeper of Southern Europe searches for its insect food on rocks. The family is found in all parts of the world.

Cremation, the burning of the bodies of the dead, a practise which was frequent in ancient times instead of burial, and which has recently been advocated on hygienic grounds by many scientific men in Europe and America on account of the dangers to the living caused by the presence of graveyards and cemeteries. Various methods of cremation have been proposed; the great difficulty being to consume the body without permitting the escape of noxious exhalations, and without mingling the ashes with foreign substances. In Siemens's process, a modification of a plan of Sir Henry Thompson, this is successfully accomplished. Cremation societies have been instituted in every European country, and in many states of the Union.

Cremo'na, a city of Italy, capital of province of the same name, 47 mi. s.e. by e. Milan. The most remarkable edifice is the cathedral, begun in 1107, and completed about 1491. Close by, and connected with the cathedral, is the Torazzo, one of the loftiest and

most beautiful towers in Italy. Cremona has considerable manufactures of silk, wool, cotton, etc. It was at one time celebrated for its violins, especially those made by Antonius Stradivarius, Joseph Guarnerius, and members of the Amati family. Pop. 30,202. The province has an area of about 500 sq. mi., and a population of 300,000.

Crenelle (krė-nel), an embrasure in an embattled parapet or breastwork. The adjective *crenellated* is applied in architecture to a kind of embattled or indented molding of frequent occurrence in buildings of the Norman style.

Cre'ole is the name which was originally given to all the descendants of Spaniards born in America and the West Indies. It is now used in a wider sense to signify the descendants of Europeans of any nation born in South America and the West Indies, as well as in some other localities. *Creole dialects* are those jargons which have originated from the mixture of different languages in the West Indies, Southern U. S., etc., and spoken by the descendants of the slaves.

Cre'osote, a substance discovered by Reichenbach about 1813 in wood tar, from which it is separated by a tedious process. It is generally obtained, however, from the products of the destructive distillation of wood. In a pure state it is oily, heavy, colorless, has a sweetish burning taste and a strong smell of peat smoke or smoked meat. It is a powerful antiseptic. Wood treated with it is not subject to dry rot or other disease. It has been used in surgery and medicine with great success.

Cres'cent, an emblem representing the moon in her horned state. This emblem is of very high antiquity, being that of the Greek goddess Artemis or Diana. It is found on medals of many ancient cities, particularly of Byzantium, from whence it is supposed to have been borrowed by the Ottomans. Since their establishment in Europe it has been the universal emblem of their empire. The crescent has given name to a Turkish order of knighthood from the form of the badge, instituted by Selim, sultan of Turkey, in 1801.

Cress, the name of several species of plants, most of them of the nat. order Cruciferæ. Watercress is used as a salad, and is valued in medicine for its antiscorbutic qualities. The leaves have a moderately pungent taste. It grows on the brinks of rivulets and in moist grounds.

Watercress.

Crest, in anc. armor, the plume or tuft of feathers, or the like, affixed to the top of the helmet. In her, the crest is a figure

originally intended to represent the ornament of the helmet, but is now generally placed upon a wreath, coronet, or cap of maintenance, above both helmet and shield. The crest is considered a greater criterion of nobility than the coat of arms itself, and it is now commonly a piece of the arms.

Creston, Union co., Ia., 114 mi. s.w. of Des Moines. Railroad, C. B. & Q. Industries: railroad repair shops, stock yards, etc. Surrounding country agricultural. Population 1900, 7,752.

Creswick (kres'ik), Thomas (1811–1869), English landscape painter. His first pictures were admitted into the Academy exhibition when he was only in his seventeenth year, and his success was afterward continuous. Among his great works are *England, London Road a Hundred Years Ago,* and the *Weald of Kent.*

Creta'ceous (or Chalk) **System,** in geology the upper strata of the Secondary series, immediately below the Tertiary series, and superincumbent on the Oolite system. This group is common to Europe, and also to a part of Asia. It consists of chalk resting upon arenaceous and argillaceous deposits, which are also regarded as part of the system.

Crete (or Candia), one of the most important islands of the Turkish Empire, situated in the Mediterranean. Area 4,026 sq. mi. High mountains, covered with forests, run through the whole length of the island in several ranges. On the north side the island declines moderately to a fertile coast, provided with good harbors; on the south side steeply to a rocky shore, with few roadsteads; and it reaches its greatest height in Psiloriti (the ancient *Ida*), 7,670 ft. high, and always covered with snow. Numerous springs give fertility to most of the valleys, in which, and on the declivities of the mountains, is seen a luxuriant vegetation. The air is mild; the summer is cooled by the north winds; the winter is distinguished only by showers of rain, The island might therefore supply, as formerly, a much larger population than at present with grain, wine, and oil, wool, flax, silk, and cotton, fish, honey, game, cattle, fruits, and even with metal in abundance. But agriculture is at a very low stage, while education and the amenities of civilized life are almost entirely absent. The inhabitants (est. at 1,200,000 in ancient times, or 900,000 in the time of the Venetians) now number about 275,000, of whom 234,000 are Christians, mostly of Greek descent. Manufactures, trade, and navigation are very insignificant. Most of the harbors are silted up. The capital, Candia, the seat of the Turkish governor, has 12,000 inhabitants; Retimo, 6,000; Canea, the most important place of trade, 8,000.

The early history of Candia is lost in the fables of Greek mythology, in which Saturn, Zeus, and Minos are spoken of as among its kings. At one time a republic, it became the seat of the Cilician pirates till conquered by the Romans, from whose hands it passed in 823 to the Saracens, and then to the Greeks again in 962. In 1204 the Byzantine sovereign sold it to the Venetians, who held it until the

second half of the seventeenth century, when the Turks conquered it after a desperate struggle and the siege of the capital for no less than twenty years. Insurrections against Turkish rule have more than once occurred, a formidable one fomented by Greece in 1868 was with difficulty suppressed after a tedious conflict. In 1877 another insurrection broke out, followed by a declaration of union with Greece in 1878. The inhabitants were pacified by the concession of self-government, etc., by Mukhtar Pasha; but religious difficulties gave rise to new troubles in 1884, when the Christian notables appealed to the sultan for a Christian governor, and succeeded in securing the reappointment of Photiades Pasha for a further term of five years. In 1897 a formidable insurrection took place and was supported by Greek troops. The powers of Europe interceded and blockaded the island with their fleets, while Turkey and Greece engaged in a brief but sanguinary conflict on their frontiers. See *Greece.*

Creuse (kr*eaz*), an inland department, France, comprising most part of the old province of Marche; area 2,150 sq. mi. It derives its name from the river Creuse, which rises in it, and traverses it diagonally in a northwest direction, afterward flowing on to join the Vienne. The surface is generally rugged, and the soil, which is thin and rests upon granitic rocks, is by no means fertile. Pop. 284,660.

Crib'bage, a favorite game at cards played with the whole pack. It may be played by two, three, or four persons; and when by two, five or six cards may be dealt to each. Five card cribbage played by two persons is the most scientific game. Sixty-one points make the game; there are no tricks and no trumps, the object being to make *pairs*, *fifteens*, *sequences*, or the *go*, or prevent the adversary from doing the same. Court cards and tens count as ten each, and all the rest count for the number of "pips" upon them. Every *pair*, that is, every couple of cards of the same value belonging to different suits (two aces, two fours, two kings, etc.), counts two; and when there are three or four similar cards, as many pairs are counted as there are different combinations of the cards taken two at a time. Every combination of cards, the united pips of which make up fifteen, counts two. A sequence consists of three or more cards of any suit following one another in rank, and counts one for each card. When the player whose turn it is to play cannot play a card without going beyond thirty-one, the other player scores one for having been the nearest to thirty-one. This is called scoring one for the "go." The remaining cards after thirty-one, or the next point to it, is made, are thrown up, and each player's cards are counted. When all the cards in a hand, either with or without the turn up card, are of one suit, or when all the cards in the crib, with the turn up card, are of one suit, it is called a *flush*, and counts one for each card. When the turn up card is a knave the dealer scores two ("two for his heels"). When a knave of the same suit with the turn up card is found in the hand of either player, the player

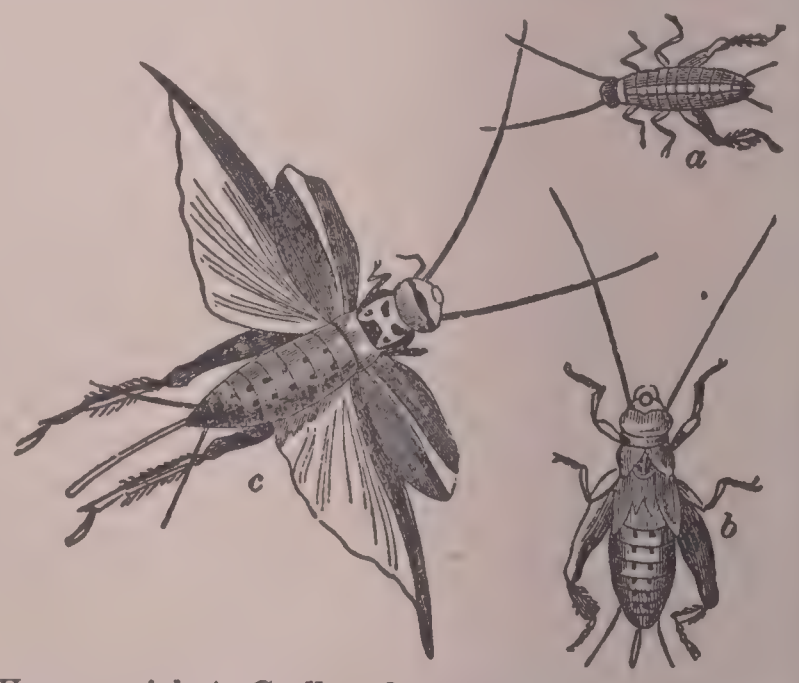
in whose hand it is scores one ("one for his nob").

Crichton (kr*ī*'ton), James (1560–1585), surnamed the *Admirable*, a Scottish celebrity, son of Robert Crichton, lord advocate. He visited Paris, Genoa, Venice, Padua, etc., challenging all scholars to learned disputations, vanquishing doctors of the universities, and disarming the most famous swordsmen of the time in fencing. He was latterly tutor to a son of the Duke of Mantua, and is said to have been stabbed to the heart in a dastardly manner by his pupil.

Cricket, an insect of several species, the house cricket, the field cricket, and the mole-

Male cricket and eggs.

cricket. The house cricket is about an inch long, with antennæ of about an inch and a half, of a pale yellowish color mixed with brown. By the friction of the peculiarly-formed wing-covers the males produce that stridulous sound by which these insects are so



House cricket *Gryllus domesticus; a.*—full-grown larva; *b.*—pupa; *c.*—perfect insect.

well known, and which has become associated with ideas of cheerful domestic comfort. They live in holes and crevices near fire places or in other warm situations, whence they come out at night to feed on crumbs and other fragments of food. The field cricket makes a similar noise.

Cricket, the English national game played with bats, balls, and wickets on a piece of

smooth greensward. It is played by two opposite sets or sides of players, generally numbering eleven each. Two *wickets* of three *stumps* each are pitched fronting each other at a distance of about 22 yds. apart, the stumps being upright rods stuck in the ground, and projecting 27 in. On the top of each set of stumps are placed two small pieces of wood called *bails*. After the rival sides have tossed for the choice of either taking the bat or fielding, two men are sent to the wickets bat in hand. The opposite or fielding side are all simultaneously engaged; one (the bowler) being stationed behind one wicket for the purpose of bowling his ball against the opposite wicket, where his coadjutor (the wicket keeper) stands ready to catch the ball should it pass near him;

Cricket Field for Fast Bowling.

the other fielders are placed in such parts of the field as is judged most favorable for stopping the ball after it has been struck by the batsman or missed by the wicket keeper. It is the object of the batsman to prevent the ball delivered by the bowler reaching his wicket either by merely stopping it with his bat or by driving it away to a distant part of the field. Should the ball be driven any distance the two batsmen run across and exchange wickets, and continue to do so as long as there is no risk in being "run out," that is, of having the stumps struck by the ball while they are out of their position near the wickets. Each time the batsmen run between the wickets is counted as a "run," and is marked to the credit of the striker of the ball. If the batsman allows the ball to carry away a bail or a stump, if he knocks down any part

of his own wicket, if any part of his person stops a ball that would have otherwise reached his wicket, or if he strikes a ball so that it is caught by one of the opposite party before it reaches the ground, he is "out," that is, he gives up his bat to one of his own side; and so the game goes on until all the men on one side have played and been put out. This constitutes what is called an "innings." The other side now take the bat and try to defend their wickets and make runs as their rivals did. Generally after two innings each have been played by the contestants the game comes to an end, that side being the victors who can score the greatest number of runs.

Crillon (krē′yoṇ), Louis des Balbes de Berton de (1541–1615), great French warrior of the sixteenth century. He distinguished himself in five successive reigns—those of Henry II, Francis II, Charles IX, Henry III, and, above all, in that of Henry IV.

Crime′a, The, a peninsula of Southern Russia, government of Taurida, to the mainland of which it is attached by the Isthmus of Perekop: area 10,000 sq. mi. Three fourths of the Crimea belongs to the region of steppes, but the other part, confined entirely to the south, and stretching along the coast from west to east, abounds in beautiful mountain scenery. Here the valleys looking southward are luxuriant with vines and olive and mulberry plantations, while the northern slope gives a large yield in cereals and fruits. The climate, however, is unequal, and in winter is severe. The chief stream is the Salghir. Others of celebrity are the Tchernaya and the Alma. The most important of the productions, besides those already mentioned, are tobacco, of which a large quantity of excellent quality is produced, flax, and hemp. The forests are of limited extent. There are large numbers of fine-wooled sheep, and horned cattle and horses are reared in large numbers. Pop. est. at 450,000. The chief town and port is Sebastopol. The country was anciently associated with the Cimmerians, and in later times with various Greek settlements and minor kingdoms. After being for some time a dependency on Rome, it was overrun by successive bodies of barbarians, and in 1237 fell into the hands of the Mongols under Genghis Khan. About 1261 the Genoese were permitted to occupy and fortify Kaffa, and they rapidly extended their power in the formation of other settlements. They were expelled, however, in 1475 by Mahomet II, who made it a dependent khanate. In 1783 the Russians took possession of the country; and with the view of overawing the Turks the great naval arsenal of Sebastopol, occupying the most commanding position in the Black Sea, was begun by Catharine II in 1786. Its military resources were steadily developed up to the time of the Anglo-French campaign (see *Crimean War*) of 1854, when it fell into the hands of the Allies.

Crime′an War, the struggle between England, France, and Turkey, on the one hand and Russia on the other, to prevent the un-

due preponderance of Russia in the east of Europe, 1854 to 1856. The old plans for the extension of Russian power conceived by Catharine II and Potemkin were resuscitated by Nicholas I, who, believing that he had secured himself from interference on the part of Austria and Prussia, and that an Anglo-French alliance was impossible, prepared to carry them into action. Servia, Bosnia, Bulgaria, and the principalities of the Danube were to become protectorates, and Constantinople was to be provisionally occupied by Russian troops. The first markedly aggressive step—the demand by Russia for a protectorate over the Greek Church throughout the Turkish empire—brought matters to a crisis. An ultimatum presented by Menschikoff in May, 1853 was rejected by the Porte; the Russians occupied the Danubian principalities; and war was declared by the Porte in October, 1853, by France and England in 1854, and by Sardinia in 1855. A French and English fleet entered the Baltic and captured Bomarsund and one of the Aland Islands, and in the south the allies landed at Varna, under Lord Raglan and Marshal St. Arnaud as commanders in chief. While the allies were making preparations Prussia and Austria demanded the evacuation of the Danubian principalities, and on evacuation being ordered by Nicholas "for strategic reasons," the principalities were provisionally occupied by the Austrians. It soon became obvious that the Crimea must be the seat of the war, and 50,000 French and English troops with 6,000 Turks were landed at Eupatoria (September, 1854). Five days later the battle of Alma was won by the allies (September 20), and the march continued toward the south side of Sebastopol. Soon after St. Arnaud d. and was succeeded by Canrobert. The siege of Sebastopol was commenced by a grand attack which proved a failure, and the Russians under Liprandi retaliated by attacking the English at Balaklava (October 25), but were defeated with heavy loss. It was at this battle that the famous, but useless, charge was made by the Light Brigade. A second attack at Inkerman was again repulsed by the allies, but the siege works made slow progress during the winter, in which the ill-supplied troops suffered great privations. The death of Nicholas and succession of Alexander II, in March, 1855, brought no change of policy. Canrobert resigned in favor of Pélissier; and shortly after an unsuccessful attack on those parts of the fortifications known as the Malakhoff and Redan, Lord Raglan d., and was succeeded by Simpson. The bombardment was continued, and in September the French successfully stormed the Malakhoff, the simultaneous attack on the Redan by the British proving a failure. The Russians, however, then withdrew from the city to the north forts and the allies took possession. The chief subsequent event was the capture of Kars, in Asia, by the Russians after a splendid defense by the Turks under General Williams. By this time, however, the allies had practical possession of the Crimea, and overtures of peace were gladly accepted. A treaty was accordingly concluded at Paris on April 27, 1856, by which the independence of the Ottoman Empire was guaranteed.

Crin'an Canal, a canal in Argyleshire, Scotland, cutting off the peninsula of Cantyre from the mainland, and greatly shortening the route from Glasgow to Oban and other parts of the west coast; 9 mi. long, 12 ft. deep, admitting vessels of 200 tons.

Crinoi'dea, the encrinites or sea-lilies, an order of Echinodermata, consisting of animals attached during the whole or a portion of their lives to the sea bottom by means of a calcareous jointed stem, from the top of which radiate feather-like flexible appendages, or arms, in the center of which is the mouth. Though comparatively few in number now, they lived in immense numbers in former ages, many carboniferous limestones being almost entirely made up of their calcareous columns and joints.

Crin'oline, properly a kind of fabric made chiefly of horsehair, but afterward generally applied to a kind of petticoat supported by steel hoops, and intended to distend or give a certain set to the skirt of a lady's dress. A horsehair and cotton fabric used as a material for making ladies' bonnets is also called crinoline.

Cripple Creek, a mining town of Colorado, about 95 mi. s.w. of Denver. The first pay mineral was discovered in this locality by a surveyor named Lowe. He worked a claim unsuccessfully for ten years, when, in 1891, he took a partner, Robert Womack, and the lode sprang into success, being now owned by the Gold King Mining Co., and gave the impetus for the Cripple Creek of to-day. The present very busy city only a few years ago was the headquarters of a cattle company. The main locality of the mines first discovered is Poverty Gulch, and from this point prospecting has gone on until the territory now worked covers miles in extent, with an absolute certainty of the existence of gold in extensive adjacent regions yet unexplored. The output of the camp in gold and silver since its first pay mine began working has been as follows: 1891, $200,000; 1892, $600,000; 1893, $2,500,000; 1894, $4,000,000; 1895, $8,100,000; 1896, $10,000,000; and the present year (1901) bids fair to equal, if not surpass the figures of previous years. Cripple Creek is thoroughly enterprising, and its citizens have pushed forward in the face of a fire which nearly wiped out the place, until they have regained all that was lost, and now the city presents all the features of an Eastern business center, with fine schools and splendid residences, an imposing board of trade, large and handsome churches, etc. Pop. 1900, 10,147.

Crisp, Charles F. (1845–1896), statesman, was b. in Sheffield, England, of American parents. After service in Confederate army he studied law; was solicitor general and judge in Georgia; member of Congress, and elected speaker fifty-second Congress.

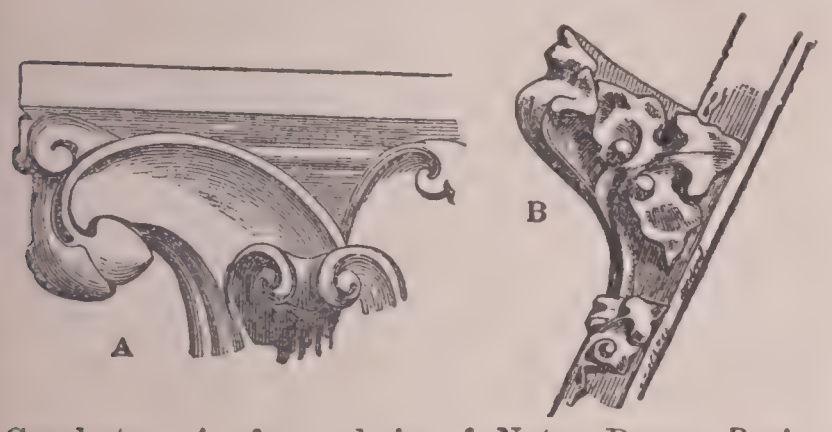
Crittenden, John J. (1787–1863), statesman, b. in Woodford co., Ky. He was a member of

the state legislature; of the U. S. Senate twice; governor of Kentucky; U. S. attorney general. By his influence the state of Kentucky maintained its adherence to the Union.

Croa'tia, a country which forms, along with Slavonia and the "Military Frontiers," a province or administrative division in the southwest of the Austrian dominions in the Hungarian portion of the monarchy, partly bounded by the Adriatic. Total area 16,411 sq. mi. The chief towns are Agram, Warasdin, and Karlstadt. Pop. 2,200,977.

Crocid'olite, an ornamental stone, a sort of fibrous quartz, now brought in considerable quantities from Cape Colony and made into articles of jewelry.

Crocket, in Gothic architecture, an ornament, usually in imitation of curved and bent foliage, but sometimes of animals, placed on

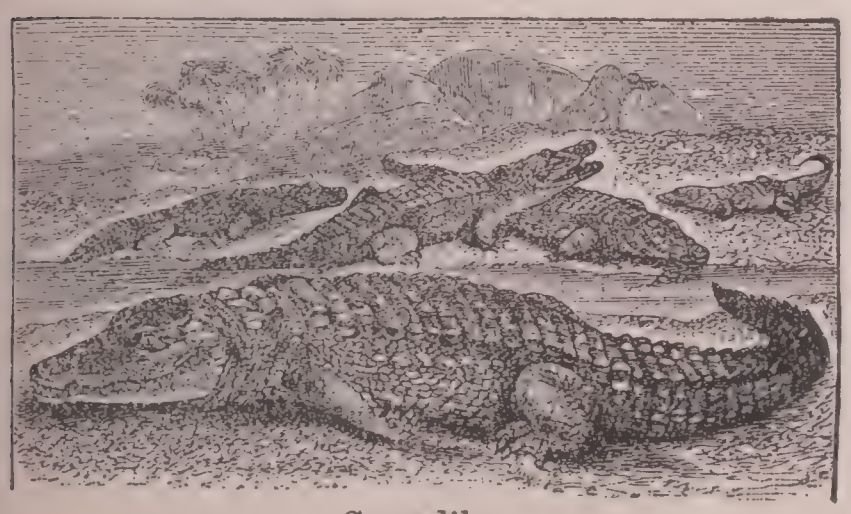


Crockets: *A.*—from choir of Notre Dame, Paris, *circa* 1160; *B.*—gable crocket, fourteenth century. (Le Duc.)

the angles of the sides of pinnacles, canopies, gables, etc. The name is also given to one of the terminal snags on a stag's horn.

Crockett, David (1786–1836), American hunter and humorist. He was elected to Congress in 1827, and re-elected in 1829 and 1831. Subsequently he went to Texas, and took part in her contest of independence. He was one of the last six who defended the fort in the siege of Fort Alamo, in San Antonio de Bexar, and was captured and put to death by General Santa Anna.

Croc'odile, a genus, family, and order of saurian reptiles, comprising the largest living



Crocodile.

forms of reptiles. The characters of the order Crocodilia are as follows: The skin is covered with square bony plates; the tail is long and compressed laterally. The four feet are short,

and there are five toes on each of the two fore feet, and four on each of the two hind feet, the latter more or less webbed; the limbs are feeble. The jaws are long and their gape of enormous width. The nostrils are at the extremity of the snout, and capable of being closed to prevent ingress of water. The heart is four-chambered. The alligators are all New World forms. The gavial proper is confined to the East Indies. The *Crocodilidæ*, to which family the crocodile belongs, have unequal teeth and no abdominal plates, and the cervical and dorsal plates are distinct for the most part. The crocodile of the Nile is the best-known member of the order; another species is met with in South Asia, Sunda, and the Moluccas. The crocodile is formidable from its great size and strength, but on shore its shortness of limb, great length of body, and difficulty of turning enable men and animals readily to escape pursuit. In the water it is active and formidable. It is exclusively carnivorous, and always prefers its food in a state of putrefaction. In Egypt it is no longer found except in the upper or more southern parts, where the heat is greatest and the population least numerous. Crocodiles are still common enough in the river Senegal, the Congo, Niger, etc. They grow sometimes to a length of 30 ft., and apparently live to a vast age.

Crocoi'sité, a mineral, a native form of lead chromate, or red lead ore. In it chromium was first discovered.

Crocus, a genus of plants of the order Iridaceæ or Iris, forming one of the most common ornaments of our gardens. Most of the species are natives of the south of Europe and the Levant; and three grow wild in Britain. They may be divided, according to their period of flowering, into *vernal* and *autumnal*.

Spring Crocus.

Crœsus, the last king of Lydia, son of Alyattes, whom he succeeded in 560 B.C., extending the empire from the northern and western coasts of Asia Minor to the Halys on the east and Mt. Taurus on the south, including the Greek colonies of the mainland. His riches, obtained chiefly from mines and the gold dust of the river Pactolus, were greater than those of any king before him, so that his wealth became proverbial. Having entered upon war with Cyrus, he was taken prisoner in his capital, Sardis (B.C. 546). The date of his death is unknown, but he survived his captor, and is referred to in the reign of Cambyses.

Croker, John Wilson (1780–1857), English writer and politician. He was one of the founders of the *Quarterly Review*, and one of

its ablest contributors. His other writings include an edition of *Boswell's Life of Johnson; Ulm and Trafalgar*, and *Talavera*, two poems; *Stories from the History of England*, from which Sir Walter Scott derived his idea of *Tales of a Grandfather;* and editions of the *Suffolk Papers*, *Lady Hervy's Letters*, *Lord Hervy's Memoirs*, and *Walpole's Letters*.

Croker, THOMAS CROFTON (1798–1854), Irish collector of folk-lore. His best-known work is his *Fairy Legends and Traditions of the South of Ireland*.

Crom'arty, a seaport of Scotland.

Crome, JOHN (1769–1821), an English artist, son of a Norwich weaver. In 1805 he founded the Norwich Society of Artists. He excelled in depicting the scenery of his native county, and especially in his handling of trees; and his high place among British landscape painters is now universally acknowledged.

Cromlech (krom'lek), an ancient monument consisting of two or more columns of unhewn stone supporting a large tabular block so as to form a rectangular chamber, beneath the floor of which is sometimes found a cist inclosing a skeleton and relics. Sometimes the cromlech was encircled by a ring of standing-stones as in the case of the Standing-stones of Stennis, in Orkney; and sometimes it was itself buried beneath a large mound of earth.

Crompton, SAMUEL (1753–1827), inventor of the mule jenny. He early displayed a turn for mechanics, and when only twenty-one years of age invented his machine for spinning cotton, which was called a *mule*, from its combining the principles of Hargreaves' spinning-jenny and Arkwright's roller-frame, both invented a few years previously.

Crom'well, OLIVER (1599–1658), Lord Protector of the Commonwealth of England, Scotland, and Ireland, was b. at Huntingdon. He was educated at Sidney-Sussex College, Cambridge. He married Elizabeth, daughter of Sir James Bourchier. In 1628 he was member of Parliament. In 1631 he went with his family to a farm which he had taken at St. Ives; and in 1636 to Ely, where he had inherited a property worth nearly $2,500 a year. In the summer of 1642 he was actively engaged in raising and drilling volunteers for the Parliamentary party. He served as captain and colonel in the earlier part of the struggle between Parliament and the king. On the occasion of the surrender of Charles by the Scottish army in 1646 Cromwell was one of the commissioners, and in the distribution of rewards for services received $12,500 a year from the estates of the Marquis of Worcester. Affairs in Ireland demanding his presence, he was appointed lord lieutenant and commander in chief; and by making a terrible example of Drogheda, crushed the royalist party in that country within six months. Resigning the command to Ireton, he undertook at the request of the Parliament, a similar expedition against Scotland, where Charles II had been proclaimed king. He saved himself from almost inevitable disaster by the splendid victory at Dunbar (Sept. 3, 1650), and a year later put an end to the struggle by his total defeat of the royalists at Worcester (Sept. 3, 1651). The Rump Parliament, as the remnant of the Long Parliament was called, had become worse than useless, and on April 20, 1653, Cromwell, with 300 soldiers, dispersed that body. He then summoned a council of state, consisting mainly of his principal officers, which finally chose a Parliament of persons selected from the three kingdoms, nicknamed *Barebone's Parliament*, or the *Little Parliament*. Fifteen months after a new annual Parliament was chosen; but Cromwell soon prevailed on this body, who were totally incapable of governing, to place the charge of the commonwealth in his hands. The chief power now devolving again upon the council of officers (Dec. 12, 1653), they declared Oliver Cromwell sole governor of the commonwealth under the name of *Lord Protector*, with an assistant council of twenty-one men. He refused the title of king. He died at Whitehall, in the sixtieth year of his age.

Cromwell, THOMAS (1490–1540), Earl of Essex, son of a blacksmith at Putney, in Surrey. He was made chief justice itinerant of the forests beyond Trent, knight of the Garter, and finally, in 1539, lord high chamberlain, and the following year Earl of Essex. He at length fell into disgrace with the king for the part he took in promoting his marriage with Anne of Cleves; and others of his political schemes failing, he was arrested on a charge of treason, and beheaded on Tower Hill.

Cronstadt (kron'stät), a town of Austria, in Transylvania, after Hermannstadt, the principal seat of the industry and trade of the province, lying in a mountainous but well wooded and romantic district near its southeast corner. Pop. 29,584.

Cronstadt, a maritime fortress of Russia, about 20 mi. w. St. Petersburg, the most important naval station of the empire. It was founded by Peter the Great in 1710, and has spacious, regular streets with handsome houses and churches, very large marine establishments, a naval arsenal, a cannon foundry, building yards, docks, etc. Pop. 48,276.

Cro'nus, in ancient Greek mythology, a son of Uranus and Ge (Heaven and Earth), and youngest of the Titans. He received the government of the world after Uranus was deprived of it, and was in turn deposed by Zeus.

Crook, GEORGE (1828–1890), soldier; graduated at West Point in 1852. He was a captain at the outbreak of the Civil War, and he closed it a brevet major general. Thence he was transferred to Arizona, and thoroughly subdued the Piutes and Apaches. Major General Crook was in command of the department of the Missouri until his death.

Croquet (krō'kā), an open-air game played with balls, mallets, hoops, and pegs on a level area, which should be at least 30 yards long by 20 wide. The iron hoops (shaped like the letter U) are fixed with their two ends in the ground, arranged in a somewhat zigzag manner over the ground; they are usually ten in number. The posts or pegs (two in number) are placed at the near and far end of the field

respectively, marking the starting and turning points. The game may be played by any number of persons up to eight, either individually, or arranged in couples or in sides. The object of the players is to drive with their mallets the balls belonging to their own side through the hoops and against the posts in a certain order, and to prevent the balls of their opponents from completing the journey before their own by playing them against those of the enemy, and driving them as far as possible from the hoop or post to be played for; the player or players whose balls first complete the course claiming the victory.

Crosby, Howard, Presbyterian clergyman; b. in New York, 1826. He was graduated at the New York University in 1844. In addition to contributions to periodicals, magazines, tracts, and lectures, he is the author of a number of theological works. Died 1891.

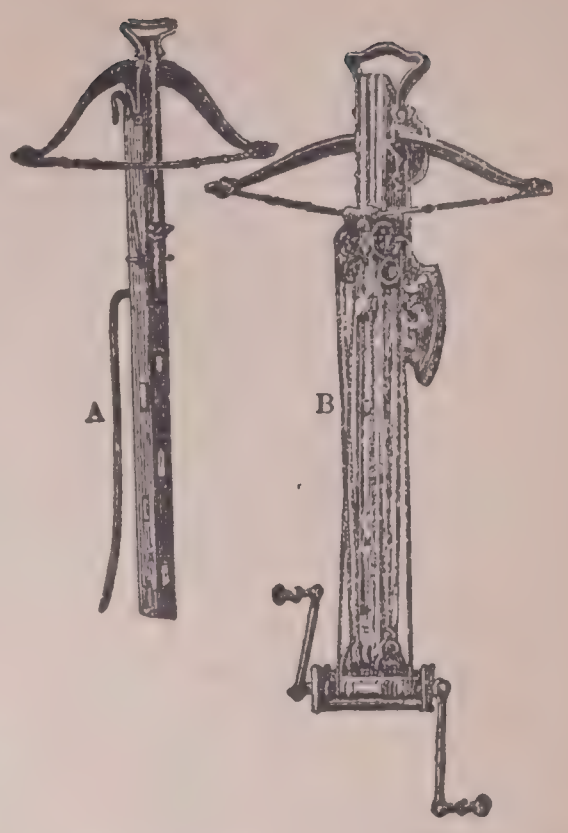
Cro'sier, the staff borne by some of the higher dignitaries of the Roman Catholic and other churches, and probably the oldest of the insignia of the Episcopal dignity. The original form of the staff resembled a shepherd's crook, but from the middle of the fourteenth century the archbishops began to carry, sometimes in addition to the pastoral crook, sometimes instead of it, a crosier terminating in a cross or double cross.

Cross, one straight body laid at any angle across another, or a symbol of similar shape. Among the ancients a piece of wood fastened across a tree or upright post formed a cross, on which were executed criminals of the worst class. It had, therefore, a place analogous to that of the modern gallows as an instrument of infamous punishment until it acquired honor from the crucifixion of Christ.

Cross'bill, a genus of birds of the finch family, deriving their name from a peculiarity of their bill, the mandibles of which are curved at the tips, so as to cross each other, sometimes on one side and sometimes on the other. The form of the bill enables them to extract with ease the seeds of the pine, their usual food, from underneath the scales of the cones. They build and also breed at all seasons of the year, in December, as in March, April, or May. The common crossbill is found in the northern countries of Europe. It is from 6 to 6½ in. in length. The male has a red plumage, the female is of a yellowish-green color. Two species of crossbill inhabit Canada and the Northern states.

Crossbill.

Cross'bow (or Arbalist), formerly a very common weapon for shooting, consisting of a bow fastened athwart a stock. The bow, which was often of steel, was usually bent by a lever windlass, or other mechanical contrivance, the missile usually consisting of a square-headed bolt or quarrel, but occasionally of short arrows, stones, and leaden bullets.



A.—hand crossbow; *B.*—rolling-purchase crossbow.

Crosse, Andrew (1784–1855), English physician and scientist. He applied electricity in the production of crystals, discovered a process of purifying salt water by electricity, and also made some curious discoveries relative to the effects of positive and negative electricity on vegetation.

Cross-staff, an instrument used by surveyors consisting of a staff carrying a brass circle divided into four equal parts by two lines intersecting each other at right angles. At the extremity of each line perpendicular sights are fixed, the instrument being used in taking offsets.

Cross-trees, in ships, certain pieces of timber at the upper ends of the lower and top masts, athwart which they are laid, to sustain the frame of the tops in the one, and extend the top gallant shrouds on the other.

Crotalaria, a genus of leguminous plants, all natives of warm climates, but some of them long cultivated in hothouses.

Crotal'idæ, a family of serpents including some of the most dangerous, above all the rattlesnakes.

Cro'ton, a genus of herbaceous plants, shrubs, and trees, comprehending a great number of species, many of which possess important medical properties.

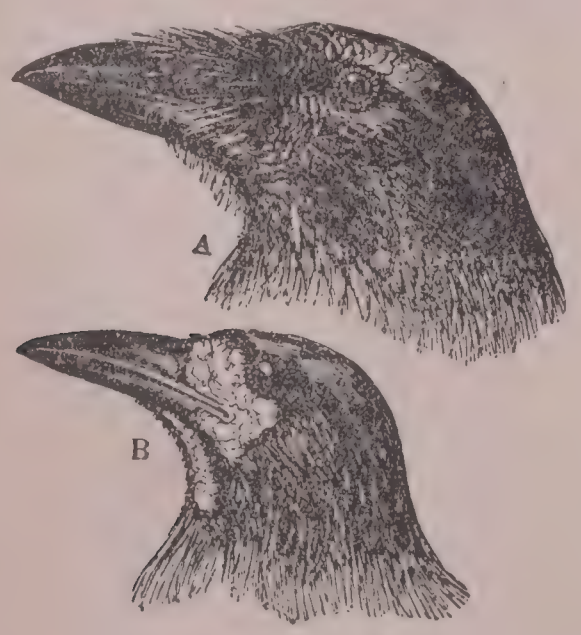
Cro'tona (Croto'na), in ancient geography, a Greek republic in Magna Græcia or South Italy, famous for its *athletæ*, among whom the chief was Milo. It is still more celebrated as the city where Pythagoras taught between 540 and 530 B.C.

Crow, a genus of birds, type of the family Corvidæ. It includes the carrion crow, the hooded crow, the raven, the rook, and the jackdaw. The carrion crow, or simply the crow, is 18 or 19 in. in length, and about 36 between the tips of the wings. Its plumage is compact and glossy blue-black with some greenish reflections. Its favorite food is carrion of all kinds; but it also preys upon small quadrupeds, young birds, frogs, lizards, etc., and is a

confirmed robber of the nests of game birds and poultry. It is not gregarious, being generally met with either solitary or in pairs. It builds a large isolated nest, with from four to six eggs, generally of a bluish-green with blotches of brown. The carrion crow is easily tamed, and may be taught to articulate words.

Croton.

The American crow is similar to the foregoing, but is smaller and less robust, and is somewhat gregarious. The crow is common in all parts of the U. S., and is deemed a great nuisance by farmers from preying on their corn. The fish crow, another American crow, resembling the preceding but smaller, is abundant in the coast districts of the Southern states. Its favorite food is fish, but it also eats all kinds of garbage, mollusca, etc. The hooded, Royston, or gray-backed crow, is somewhat larger



A.— Crow; *B.*— Rook.

than the rook. Its head, wings, and tail are black, but less bright than in the rook; the rest of the body is a dull smoke-gray. Its food is similar to that of the carrion crow, and it builds a similar nest. The crow as a weather prophet is entitled to the highest distinction.

When rain is approaching a whole community will rise from their nests or perches, wheel about for some time, and then return to their haunts.

Crowberry (or Crakeberry), a plant resembling the heaths, and bearing a jet-black berry, common in all the northern parts of Europe and Asia and North America. The berries, which have a slight acid taste and are sometimes eaten, afford a purple dye. The red crowberry which has a red fruit, grows in the neighborhood of the Straits of Magellan.

Crow Blackbird, the name of certain American birds, found in the Southern states, Mexico, and the West Indies, is 16 in. long, and of a glossy black plumage. The female is of a light-brown above and whitish beneath. The purple grackle, lesser or common crow blackbird, is similar in color to the preceding, but smaller. They reach the Middle states from the south in flocks in the latter part of March, and build in April in the tall pines or cedars. On their first arrival they feed upon insects, but afterward commit great ravages upon the young corn. In November they fly southward again.

Crown Glass, the hardest and most colorless kind of window glass, made almost entirely of sand and alkali and a little lime, and used in connection with flint glass for optical instruments in order to destroy the disagreeable effect of the aberration of colors.

Crown Wheel, a wheel with cogs or teeth set at right angles to its plane, the wheel in certain watches that drives the balance.

Croy'don, a borough of England, in Surrey, 10 mi. s. of London, of which it is practically a suburb. The town, which is a favorite residence of merchants and business men, retired tradesmen, etc., is surrounded by fine villas, mansions, and pleasure grounds. It is a place of ancient origin, but from its recent rapid increase is almost entirely new. Of special interest are the remains of the ancient palace, long a residence of the archbishops of Canterbury. Pop. 102,697.

Cro'zet Islands, a group of four uninhabited islands in the South Indian Ocean, between Kerguelen and Prince Edward Islands. They are all of volcanic origin, and the most easterly of them, East Island, has peaks exceeding 4,000 ft. The largest, Possession Island, is about 20 mi. long by 10 broad.

Cru'cian Carp, a thick, broad fish, of a deep yellow color, differing from the common carp in having no barbules at its mouth, inhabiting lakes, ponds, and sluggish rivers in the north of Europe and Asia.

Cru'cible, a vessel employed to hold substances which are to be submitted to a high temperature without collecting the volatile products of the action. It is usually of a conical, circular, or triangular shape, closed at the bottom and open at the top, and is made of various materials, such as fireclay, platinum, a mixture of fire clay and plumbago, porcelain, etc.

Crucible.

Crucif'eræ, a very extensive nat. order of dicotyledonous plants, consisting of herbs which all have flowers with six stamens, two of which are short, and four sepals and petals, the spreading limbs of which form a Maltese cross, whence their name. The fruit is a pod with a membranous placenta dividing it into two cells. The mustard, water-cress, turnip, cabbage, scurvy grass, radish, horse-radish, etc., belong to this family.

Cruden, ALEXANDER (1701–1770), was b. at Aberdeen. His great work appeared in 1737, under the title of *A Complete Concordance of the Holy Scriptures of the Old and New Testament.*

Cruikshank, GEORGE (1792–1878), the greatest of English pictorial satirists after Hogarth, b. in London. The earliest of his drawings known is dated 1799, when he was only seven years of age, and when fifteen he was comparatively distinguished. He illustrated a number of popular books. Poorly paid for work by which others profited, he was latterly obliged to part with the vast collection of his works, and in 1866 $250 a year was settled on him from the Royal Academy's Turner Annuities.

Cruive (krövv), a trap for fish, especially salmon, consisting of a sort of hedge of stakes on a tidal river or the sea beach. When the tide flows the fish swim over the wattles, but are left by the ebb.

Crusades, the wars carried on by the Christian nations of Western Europe, from the end of the eleventh till the latter half of the thirteenth century, for the conquest of Palestine. They were called *Crusades*, because the warriors wore the sign of the cross. The antagonism between the Christian and Mohammedan nations had been intensified by the possession of the Holy Land by the Turks and by their treatment of pilgrims to Jerusalem; and the first strenuous appeal was assured of response alike from the pious, the adventurous, and the greedy. The immediate cause of the *first Crusade* was the preaching of Peter of Amiens, or Peter the Hermit, who in 1093 had joined other pilgrims on a journey to Jerusalem. On his return he gave Pope Urban II a description of the unhappy situation of Christians in the East, and presented a petition for assistance from the Patriarch of Jerusalem. The statements of the pope at the councils of Piacenza and Clermont in 1095 produced a profound sensation throughout Europe, and in 1096 several armies set out in different divisions, most of which, being ignorant of military discipline and unprovided with necessaries, were destroyed before reaching Constantinople, which had been chosen for their place of meeting. A well-conducted regular army, however, of 80,000 men was headed by Godfrey of Bouillon; Hugh of Vermandois, brother to Philip, king of France; Baldwin, brother of Godfrey; Robert II of Flanders; Robert II of Normandy, brother of William II, king of England; Raymond of Toulouse; and other heroes. They traversed Germany, Hungary, and the Byzantine Empire, passed over into Asia Minor, conquered Nicæa in June, 1097, and shortly after, on July 4, fought the

first pitched battle at Dorylæum, being completely victorious after a severe contest. They then marched through Asia Minor upon Antioch, which, with the exception of the citadel, fell into their hands by treachery in June, 1098. Surrounded in turn by a Turkish army, they were soon reduced to pitiable straits, but succeeded in routing their besiegers on June 28. After remaining nearly a year in the neighborhood of Antioch they commenced, in May, 1099, their march against Jerusalem, the siege of which they commenced in June. Their numbers were now reduced to little more than 20,000 men; but after a fierce struggle the town was taken by storm on July 15, and Godfrey of Bouillon was chosen king of Jerusalem, or, as he preferred to term himself, Protector of the Holy Sepulcher.

The *second* great and regularly-conducted Crusade was occasioned by the loss of Edessa, which the Saracens conquered in December, 1144. Fearing still graver losses, Pope Eugenius III, seconded by Bernard of Clairvaux, exhorted the German emperor Conrad III, and the king of France, Louis VII, to defend the cross. Both these monarchs obeyed, and in 1147 led large forces to the East, but returned without accomplishing anything in 1149.

The *third* Crusade was undertaken after the capture of Jerusalem by Saladin in 1187, the monarchs Frederick I (Barbarossa) of Germany, Philip Augustus of France, and Richard I (Cœur de Lion) of England, leading their armies in person. Richard and Philip Augustus met at Vezelai in June, 1190, and agreed to unite their forces at Messina in Sicily where they spent six months at the end of 1190 and beginning of 1191. Philip joined the other Crusaders before Acre on April 13, 1191; but Richard, whose fleet was separated by a storm, went to Cyprus, and, dispossessing Isaac Comnenus, made himself king. Jealousies arose between the monarchs, and within a few weeks after the fall of Acre the French king returned to Europe. Richard, now sole leader of the expedition, defeated Saladin and occupied Jaffa or Joppa; but having twice vainly set out with the design of besieging Jerusalem, he concluded (Sept. 2, 1192) a truce of three years and three months with Saladin, who agreed that pilgrims should be free to visit the Holy Sepulcher, and that the whole sea coast from Tyre to Jaffa (including the important fortress of Acre) should belong to the Crusaders.

The *fourth* Crusade was set on foot by Pope Innocent III, who commissioned Fulk of Neuilly to preach it in 1198. Among its chief promoters was Godfrey of Villehardouin, seneschal of Champagne; Baldwin, count of Flanders and Hainaut; Dandolo, the aged doge of Venice; and the Marquis of Montferrat, who was chosen leader. The Crusaders assembled at Venice in the spring of 1202, but were diverted from their original purpose first by the capture of the Dalmatian town of Zara, and then by the expedition which ended in the sack of Constantinople and the establishment of a Latin empire there (1204).

The *fifth* Crusade, undertaken by Andreas

of Hungary in 1217, and shared in by John of Brienne, to whom the title of King of Jerusalem was given, had little other result than the temporary occupation of the Nile delta.

The *sixth* Crusade, that of Frederick II, emperor of Germany, was undertaken at the instance of Popes Honorious III and Gregory IX. On arriving he entered into negotiations with the Sultan of Egypt, and without any fighting recovered for himself, as heir of John of Brienne, the kingdom of Judea, on the condition of tolerating in his kingdom the Mohammedan worship. He then concluded a useless truce of ten years, got himself crowned at Jerusalem, and returned in 1229.

The *seventh* and *eighth* Crusades were led by St. Louis of France (Louis IX) in person. He took Damietta in June, 1249, and marched up the Nile, but was compelled to retreat, and finally to surrender with his whole army. The second expedition of Louis was still more disastrous in its results than the first. He landed his army in 1270 on the northern coast of Africa; but he himself and a large number of his knights died before Tunis, and the majority of the French Crusaders returned home. A crusading army under Prince Edward of England (afterward Edward I), originally intended to co-operate with that of Louis, landed at Acre in 1271, but little was effected beyond a new truce for ten years (1272). For nineteen years longer the Christians in Palestine held with great difficulty the remnants of the Latin kingdom there. But Tyre and Berytus (Beyrout) were successively snatched from them, and finally the capture of Acre by the Sultan of Egypt in 1291 put an end to the kingdom founded by the Crusaders.

Despite their want of success, however, the Crusades were of considerable indirect value in that by these joint enterprises the European nations became more connected with each other, the class of citizens increased in influence, partly because the nobility suffered by extravagant contributions to the Crusades, and partly because a more intimate commercial intercourse greatly augmented the wealth of the cities, and a number of arts and sciences, till then unknown in Europe, were introduced.

Crusta′cea, one of the primary branches into which is divided the great group of Articulate or Annulose animals. The body is divided into head, thorax, and abdomen, of which the two former are united into a single mass, cephalothorax, covered with a shield or carapace, and the abdomen usually presents the appearance of a tail. In some—the sand hopper, wood louse, etc.—the head is partially distinct from the thorax. The Crustacea breathe by branchiæ or gills, or by membranous vesicles, or by the general surface; and the body is composed of a series of rings more or less distinct. They possess the faculty of reproducing lost parts in an eminent degree. The integument is chitinous and remains elastic in some, as the Isopods, throughout life. But in the majority it is calcified or transformed into a hard shell, prisms of carbonate of lime being deposited in the outer layer. It consists of a great number of distinct pieces connected together by portions of the epidermic envelope, just as among the higher animals certain bones are connected together by cartilages. Several species, if not all, molt or cast these outer skeletons or shells in the progress of growth; this is the case with crabs, crayfish, etc. The general grouping of the Crustacea is sometimes based upon the successive metamorphoses which the higher Crustaceans undergo before reaching the adult form. Thus the first stage of the lobster embryo is that of a minute object with three pairs of limbs, known as the Nauplius form; in the second stage, the cephalo thorax is provided with anterior, posterior, and lateral spines; the final form being reached by a series of moltings.

Cry′olite (or Kryolite), a mineral, a native fluoride of aluminium and sodium, found at Evigtok, in Greenland, whence it is exported. It is of a pale grayish-white or yellowish brown, occurs in masses of a foliated structure, and has a vitreous luster. It has been employed as a source of aluminum, and in the manufacture of a hard porcelanous glass of great beauty.

Cryoph′orous, an instrument for showing the diminution of temperature in water by its own evaporation. Wollaston's cryophorous consists of two glass globes united by a moderately wide glass tube. Water is poured in and boiled to expel the air, and while boiling the apparatus is hermetically sealed. When it is to be used the water is made to run into one of the globes, and the other is buried in a freezing mixture. The aqueous vapor in the globe being thus condensed, a vacuum is produced, fresh vapor rises from the water in the other globe, which is again condensed, and this proceeds continuously till the water remaining in the globe has been, by the evaporation, cooled to the freezing-point.

Cryptog′amous Plants (Cryptogamia), in botany, the division embracing the lower classes of plants having no evident flowers or in which the reproductive organs are obscure.

Cryptog′raphy, the art of writing in secret characters or cipher, or with sympathetic ink. The simplest method consists in choosing for every letter of the alphabet some sign, or another letter or group of letters.

Crystal, in chemistry and mineralogy, any body which, by the mutual attraction of its particles, has assumed the form of some one of the regular geometric solids, being bounded by a certain number of plane surfaces. The chemist procures crystals either by fusing the bodies by heat and then allowing them gradually to cool, or by dissolving them in a fluid and then abstracting the fluid by slow evaporation.

Crys′talline Rocks, rocks of a crystalline texture, such as granite, believed to have acquired this character by the action of heat and pressure.

Crystal′lomancy, a mode of divining by means of a transparent body, as a precious stone, crystal globe, etc. The operator first muttered over it certain formulas of prayer, and then gave the crystal (a beryl was pre-

ferred) into the hands of a young man or virgin, who received an answer from the spirits within the crystal.

Cuba, the largest and most important of the West Indies, has a delightful climate, rich soil, and luxuriant tropical growth, and enchanting natural scenery. Its coast line of 1,600 mi. furnishes no less than twenty-seven excellent harbors. This advantage, combined with its favored position at the entrance of the Gulf of Mexico, gives it a commercial value incomparable with the extent of its territory, which, including the Isles of Pines and some other small islands, aggregate about 45,872 sq. mi. The island measures from east to west 760 mi., and is traversed by a mountain range, the most elevated summit of which is 7,670 ft. From this central water-shed, short rivers flow north and south. One half of the island is covered with forests filled with a dense growth of underbrush, while the dry plains are a jungle of bushes and grass, which, during the rainy season, become impassable swamps. There are several large salt water lagoons on the north side of the island.

Havana, the capital and largest city, has an equable temperature, the mean average ranging from 77° to 80°. The foundation of this city dates from 1519, being the oldest city in America founded by Europeans. The census of 1899 showed a population of 235,981. The venerable cathedral, supposed to contain in an urn the bones of Columbus, is here, as well as the famous Moro Castle, in which so many political prisoners, including many Americans, have been incarcerated. For defense of the harbor newer fortifications have been erected on neighboring heights. At Havana and in other seaports yellow fever prevails during the summer. Santiago on the south, Matanzas on the north, and Puerto Principe inland, are the cities next in order of population.

The principal products of Cuba are sugar, tobacco, and coffee. Maize is indigenous; two crops are produced each year. Rice in small quantities is grown. Oranges and bananas have value as export articles, while mahogany and cedar woods come next in importance. Pineapples, melons, lemons, limes, figs, and strawberries are quite extensively cultivated. In Cuba the sugar planter is the prince of agriculture. The grinding season lasts twice as long as in Louisiana. The production of sugar is now about one million tons per annum, but it is estimated that the island is capable of yielding five times as much. The Spanish government has control of the tobacco trade and imposes restrictions that make the profits to the producer uncertain; for this reason those interested in the tobacco industry usually favor the revolution. The richest tobacco region in the world is the province Pinar del Rio. Coffee culture was introduced from Hayti (1748). Impetus was given to coffee culture by the superior methods brought in by French planters who fled from San Domingo (1798). Competition with Brazil long since crippled the coffee trade in Cuba. The most important mineral product is bituminous coal, though copper, iron, and even gold and silver are found. The census of 1899 gives the population of Cuba as 1,572,797, 32 per cent. of whom are colored. The whole island excepting Havana was, for many years, neglected by the Spanish owners. Consequently whenever Europe was engaged in war with Spain, Cuban waters were the scenes of bloody combat. Havana was destroyed by the French 1534, and again in 1554. In 1624 it was captured by the Dutch but subsequently restored to Spain. Havana was captured by the English assisted by the colonies of New York, New Jersey, and Connecticut in 1762, but within a year was exchanged for Florida. When in 1808 the French deposed the reigning family in Spain, Cuba declared war against Napoleon. From 1810 Cuba was governed by a foreign captain general. His government combined with excessive taxation caused discontent, which became defiance in 1836 when Cuba was denied the benefits of the new constitution granted Spain. In 1844 and 1848 there were insurrections of the negroes, but these were soon quelled. The U. S. wishing to extend its slave territory (1848), offered to buy Cuba. The Ostend Manifesto issued in 1854 declared that if Spain would not sell Cuba, the U. S. should seize and annex the island. Before this, an attempt had been made (1850–1851) by Narcisso Lopez, assisted by adventurers from the U. S., to seize Cuba. The Cubans themselves repelled the intruders. During the ten years' war for Cuban independence which began in 1868 under the famous Maximo Gomez, Captain Fry of the *Virginius* with fifty-two other American prisoners, was shot (1873) at Santiago, condemned as pirates. This war was terminated 1878 by the treaty of Elzanjon with Martinez Campos, acting captain general. By this treaty personal rights were granted the Cubans and the early abolishment of slavery provided for. The promises were fair but the fulfillment false. Nothing was really changed; the government was mal-administered under softer names. Captain general became governor general, and the "law of vagrancy" took the place of the right of banishment. Taxation without the consent of the Cubans still existed. Native Cubans were excluded from offices of influence. The whole island was still governed in the interests of Spain. The mother country had but one policy for Cuba; to raise the largest revenue possible, and give the people the smallest return. Export duties were laid on her products and tariff on her imports. The Cuban deputies in the Cortes at Madrid were without power or influence. Slavery was abolished in 1886, since which time Cuba has suffered from scarcity of labor, for in 1873 the Chinese government had stopped the emigration of its subjects to this island, and the negro population had been diminished by excessive infant mortality.

Cuban exiles continued to agitate for "*Cuba libre,*" and in 1894 a revolutionary council was formed with Jose Marti as leader, and head-

quarters at New York. Arms were smuggled into Cuba, and secret preparations were going on at home and abroad. In January, 1895, a filibustering expedition, organized by Antonio Maceo and Jose Marti at Fernandina, Fla., was broken up on the eve of sailing. The formal declaration of war bears date Feb. 24, 1895. Maximo Gomez was given command of the revolutionary forces. The insurgents carried on guerrilla warfare, playing hide and seek with the Spanish forces in the mountains and swamps. A plot to exterminate the Spanish soldiery and to burn everything burnable came to light, and Callya, the governor general, proclaimed martial law in the threatened provinces. Raids were made upon the plantations, the crops ruined, and the laborers enticed away, but the Spanish troops operated without success, for the insurgents would disappear in the mountains and swamps at their approach. The rebels themselves were handicapped by the attitude of the autonomists who, while complaining bitterly against Spanish misrule, were unwilling to fight, limiting their demands to home-rule. Nearly all the negroes belong to the revolutionary party. Those holding office and those of Spanish birth make up the royalist party. March, 1895, Maceo landed from Costa Rica and made his way through the eastern part of the island until he met a body of rebels who hailed his coming with joy. He and his brother Jose were made generals. In April of the same year Maximo Gomez and Jose Marti landed from San Domingo. Gomez was immediately made commander-in-chief. The rebels now took fresh courage, remembering their leaders' prowess in the former war. Marti, wishing to go to the U. S., set out May 19, but was led into ambush by a treacherous guide and killed almost in sight of camp. Governor general Callega had been relieved in April by field marshal Campos. The revolt went on with the advantage to the rebels that they were kept informed of the movements of the government troops. Campos divided the island into belts running military lines north and south, hoping thus to crowd the rebels off the island. On the contrary, he failed in the campaign of 1895, and went home to Spain to make way for the cruel, Gen. Valeriano Weyler, who arrived February, 1896. He found the insurgents near Havana, they having in their westward march laid waste the whole country. At the end of 1895 Spain had 200,000 men in the field and the insurgents about 60,000. Weyler tried in vain to prevent concert of action between Gomez and Maceo (the latter being in Pinar del Rio province), by throwing trochas, lines of fortified posts close together, across the island. Dec. 6, 1896, Maceo was killed, probably through the treachery of Dr. Zertucha of his staff. The campaign of 1897 opened at Tapesto, near Havana, where the Spanish forces were finally successful. On Jan. 13, the Cubans won a decisive victory at Gabuquito, the Spanish forces being utterly routed. Four days later the insurgents attacked some gunboats in the Cauto river, sinking two of them and causing considerable loss

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to the Spanish forces. In March one of the Cuban generals, General Rivera, was captured with a force of one hundred men and was made a prisoner of war. In May the Spanish forces were severely defeated while en route from Manzanillo to Bayamos with provisions for the latter town. The Spanish lost 5,000 men, besides large quantities of provisions and military supplies. Later in the month the insurgents attacked Baracoa and Fort Lama, but were repulsed at both places. In June General Weyler planned a campaign into Santiago. He left Havana with about forty battalions of infantry, and a strong force of cavalry and artillery. The insurgents immediately moved upon Havana, after concentrating their forces at Matanzas. Early in July they entered a suburb of Havana and secured $15,000 worth of goods. With the beginning of the rainy season General Weyler ceased operations and offered quarter to all who would surrender. The insurgents continued operations and on the 7th of August a body of troops under Gomez met a large force of Spaniards under Weyler at Matanzas and defeated them.

On the 14th of August Weyler tendered his resignation because of the death of Canovas, the Spanish premier. He was requested to remain until his successor should be appointed. On the 10th of September the rebels took Victoria de las Tunas, and an exchange of prisoners, the first of the war, was effected. A little later in the month the Spanish, aided by warships, destroyed the towns of Tasajeras and Bijara. A few skirmishes ended the month of September. In October Gen. Ramon Blanco was appointed to succeed General Weyler, and arrived in Havana the latter part of the month. He at once issued a long proclamation setting forth the desires of Spain for peace, and offering pardon to all who would return to Spanish allegiance. He also proposed, in case the natives did not lay down their arms' to put a stop to the rebellion in a short time.

On the 4th of November the Cuban presidential election was held at Guaymatillo in the province of Puerto Principe, and the following officers were elected:

President, Gen. Bartolme Masso; vice-president, Mendez Capote; secretary of war, Brigadier Aloman; secretary of state, Fonte Sterling; secretary of foreign affairs, Monreno Delatorre; secretary of the interior, Dr. Manuel R. Silva; commander-in-chief of the army, Gen. Maximo Gomez; inspector-general, Carlos Roloff.

In the latter part of November the official Spanish *Gazette* published a scheme of autonomy for the islands of Cuba and Puerto Rico. This scheme had been adopted previously by the Spanish cabinet. Following is a brief of the plan:

1. The principles of the governments of the two islands.

2. The government of each island shall consist of a parliament, divided into two chambers, while a governor-general, representing

the home government, shall exercise in its name the supreme authority.

3. The faculty of making laws on colonial affairs rests with the colonial parliament and the governor-general.

4. The colonial representatives shall be composed of two corporations with equal power—a chamber of representatives and a council of administration.

5. The council of administration shall consist of thirty-five members, of whom eighteen shall be elected and seventeen nominated by the home government.

As soon as the scheme for autonomy was made known in Cuba, Generals Gomez and Garcia issued military orders to the effect that any Cuban who should listen to the autonomy proposals would be treated as a traitor, and that any Spanish agent coming to confer about them would be killed as a spy.

The orders emanated from the headquarters of the general-in-chief of the Cuban army at Sancti Spiritus. The president of the Cuban Republic, Capote, closed an address to the representatives of the Cuban people as follows:

"We are firmly determined to carry on the war until victory or death crowns our efforts."

The plan of autonomy proposed by Spain was not accepted by the Cubans. It might have been successful a few years earlier, but it came too late. Spanish sovereignty was doomed.

Nothing of great importance happened in the early part of 1898, the war being carried on with no special advantage to either side. It was clearly demonstrated that under existing methods Spain could not subdue the rebellion. On the 8th of January the third public appeal was made in the U. S. for aid for the suffering Cubans. On the 9th of February Captain-General Blanco returned to Havana from an unsuccessful campaign against the insurgents. Ten days later the Spanish forces were defeated by the insurgents, who immediately moved in the direction of Havana. On the last day of March a decree was issued by General Blanco ending the reconcentration in the provinces of Pinar del Rio, Havana, Matanzas, and Santa Clara. The decree did not apply to the provinces of Puerto Principe and Santiago de Cuba.

At length unable longer to endure the state of affairs existing in Cuba and the inhuman treatment which the Cubans were receiving from the Spanish officials, the United States in April, 1898, demanded that Spain withdraw her military and naval forces from Cuba, and the Spanish-American war began. For full account of the war see the article *United States of America*, sub-head *History* (Vol. IV).

So far as Cuba was concerned the peace protocol (executed Aug. 12, 1898) provided "That Spain will relinquish all claim of sovereignty over and title to Cuba; that Cuba shall be immediately evacuated, and that commissioners, to be appointed within ten days, shall, within thirty days from the signing of the protocol, meet at Havana to arrange

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and execute the details of the evacuation."

By the terms of the formal treaty of peace signed at Paris, December 10, 1898, "Spain relinquishes all claim of sovereignty over and title to Cuba, and as the island is, upon its evacuation by Spain, to be occupied by the United States, the United States will, so long as such occupation shall last, assume and discharge the obligations that may under international law result from the fact of its occupation for the protection of life and property. It is understood that any obligations assumed in this treaty by the United States with respect to Cuba are limited to the time of its occupancy thereof; but it will upon the termination of such occupancy advise any government established on the island to assume the same obligations."

In October, 1898, arrangements were made for the evacuation of Cuba and January 1, 1899, was fixed as the date on which Spanish control should cease. Major-General John R. Brooke assumed the office of military and civil governor, and military governors were appointed for each of the six provinces. Considerable trouble resulted from the presence of Spanish soldiers in Havana; the troops had not been paid by Spain, and showed a mutinous spirit. Their enmity toward the Cubans broke out several times in the form of street fights and riots.

The attitude of part of the Cubans toward the United States was not altogether friendly. They expected the U. S. to hand over to them immediately the control of Cuban affairs. As there was no established government in the island and as the U. S. had assumed great responsibility as defined by the Paris treaty, this was manifestly impossible. General Garcia was sent to Washington to present to President McKinley the request of the Cubans, but his sudden death on December 11 in that city frustrated the plans. The Cuban army remained as it was before and during the war, and until this force was disbanded there could be no permanent peace in the island. It was proposed, therefore, to divide among the officers and men of the Cuban army $3,000,000 and have them retire to the plantations where they were much needed. About 40,000 Cubans received a share of the money.

Census taken in 1899.—In order to establish civil government it was necessary to determine the number of people in the island, who were citizens and who were not. The U. S. war department, therefore, took the census of Cuba in October, 1899. The total population was 1,572,797, distributed among the six provinces as follows:

Habana	424,804
Matanzas	202,444
Pinar del Rio	173,064
Puerto Principe	88,234
Santa Clara	356,536
Santiago	327,715

The last census taken under Spanish authority was in 1887. The total population as returned by that census was 1,631,687. By provinces it was as follows:—

Habana	451,928
Matanzas	259,578
Pinar del Rio	225,891
Puerto Principe	67,789
Santa Clara	354,122
Santiago	272,379

Whether the census of 1887 was correct is a matter of discussion, but if incorrect, the number of inhabitants was certainly not overstated. Comparing these two censuses, it is seen that the loss in the twelve years amounted to 58,890, 3.6 per cent of the population in 1887. This loss is attributable to the recent civil war and the reconcentration policy accompanying it, but the figures express only a part of the loss from this cause. Judging from the earlier history of the island and the excess of births over deaths, as shown by the registration records, however imperfect they may be, the population probably increased from 1887 up to the beginning of the war, and at that time reached a total of little less than 1,800,000. It is probable, therefore, that the direct and indirect losses by the war and the reconcentration policy, including a decrease of births and of immigration and an increase of deaths and of emigration, reached a total of approximately 200,000.

Density of Population.— As before stated, the area of Cuba is about 45,872 square miles, and the average number of inhabitants per square mile 35.7. The areas of the six provinces and the average density of population in each is as follows: —

Province.	*Area.*	*Inhab. per sq. mi.*
Habana	2,772	153
Matanzas	3,700	55
Pinar del Rio	5,000	35
Puerto Principe	10,500	8
Santa Clara	9,560	37
Santiago	12,468	26

Cities of Cuba.— There are ninety-six cities having a population of 1,000 inhabitants or more. Of these twenty-nine have population in excess of 5,000; five in excess of 25,000; and one, Habana, a population of 235,981.

The following cities have population in excess of 5,000: —

Cities.	*Population.*
Caibarien	7,013
Canajuani	5,082
Cardenas	21,941
Cienfuegos	30,038
Colon	7,175
Gibara	6,841
Guanabacoa	13,965
Guanajay	6,483
Guantanamo	7,137
Guines	8,149
Habana	235,981
Holguin	6,045
Manzanillo	14,464
Marianao	5,416
Matanzas	36,374
Melena	5,016
Pinar del Rio	8,880
Placitas	5,409
Puerto Principe	25,102
Regla	11,363
Remedios	6,633
Sagua la Grande	12,728
San Antonio de los Banos	8,178
Sancti Spiritus	12,696
San Luis	5,059
Santa Clara	13,763
Santiago	43,090
Santiago de las Vegas	7,151
Trinidad	11,120

Race, Sex, Nativity, Age, Citizenship, and Conjugal Condition.— Cuba had 57,613 more males than females, an excess equal to 3.6 per cent of the entire population. In this respect Cuba differs from all the West India islands in the vicinity. The excess of males decreased rapidly since 1887. Comparing the census of 1887 with that of 1899, it is seen that the females increased 2 per cent, and the males decreased 6 per cent. From the time of the first Cuban census in 1775, as quoted by Humboldt, this excess of males has been a constant characteristic of the population.

The population is divided by race into white, negro, mixed, and Chinese. Again the whites are divided into two classes, native white and foreign white. The three classes, mixed, negro, and native white, which are entirely or in great part natives of Cuba have a perceptible excess of females, while the two classes of immigrants, the foreign whites and Chinese, have a far greater excess of males. Therefore the excess of males in Cuba is due to the character of the immigration.

The native whites constitute 57.8 per cent of the total population. The foreign whites constitute but 9 per cent; the colored, including the negro and mixed, amounted to 32 per cent, or less than one-third; the Chinese make up less than one per cent of the total. Chinese immigration into Cuba began in 1847, and in 1861 there were 34,834 Chinese in the island, but they have been gradually disappearing.

The number of children in the island under 5 years of age was 8.3 per cent of the total; the number of school age, from 5 to 17, was 35.2 per cent; the number of persons above 45 was 14.2 per cent.

Of the population of Cuba 89 per cent were born in the island, 8 per cent in Spain, and only 3 per cent in other countries. In the matter of citizenship, 83 per cent claimed Cuban citizenship, only 1 per cent the protection of Spain, while 11 per cent had not, at the time of the census, declared their intentions. Five per cent of the population claimed citizenship other than Cuban or Spanish.

The census showed that 70.5 per cent of the entire population were single. In 1861 the per cent was 80 for the whole population, and 90 for the colored alone. The decrease in the per cent of single since 1861 is due mainly to the recognition in the present census of a class of persons living together as husband and wife by mutual consent. These were not so counted in the census of 1861.

Illiteracy.—As stated before, the number of persons of school age was 35.2 per cent, or 552,928. Of these only 90,072, or 16.3 per cent, actually attended school at any time during the year preceding the census. By dividing the population into two classes—those over ten years of age and those under 10—and assuming that those who learn to read and write, do so before they are 10 years old, it was ascertained that of the 1,215,810 persons over 10 more than two-fifths could read and write, and less than three-fifths could not. It was estimated that the number of those who could not read and write decreased since 1861 from 81 per cent to 63.9 per cent; or in thirty-eight years the illiterates decreased from over four-fifths to less than two-thirds of the entire population.

Summary of Census of 1899.—The following is a summary for the entire island with regard to race, nativity, and sex; age and sex; conjugal condition; birthplace; citizenship, and school attendance, illiteracy, and superior education:—

Race, Nativity, and Sex.

Total population	1,572,797
Male	815,205
Female	757,592
Native White	910,299
Male	447,373
Female	462,926
Foreign White	142,198
Male	115,740
Female	26,458
Colored	520,300
Negro	234,638
Male	111,898
Female	122,740
Mixed	270,805
Male	125,500
Female	145,305
Chinese	14,857
Male	14,694
Female	163

Age.

Under 5 years of age	130,878
5 to 17 years	552,928
18 to 20 years	111,575
21 to 44 years	553,922
45 years and over	223,494

Conjugal Condition.

Single	1,108,709
Married	246,351
Living together	131,787
Widowed	85,112

Birthplace.

Cuba	1,400,262
Spain	129,240
Other countries	43,207

Citizenship.

Cuban	1,296,367
Spanish	20,478
In suspense	175,811
Other citizenship	79,525

School Attendance, Illiteracy, and Superior Education.

Under ten years of age	356,987
Attended school	40,658
Ten years of age and over	1,215,810
Attended school	49,414
Can neither read nor write	688,555
Have superior education	19,158

Education.—On Dec. 6, 1899, the American military governor published an order reorganizing the elementary and secondary school system of the island. It provided that there should be a board of education in each municipality to take charge of the schools, with the mayor as president, whose duty it is to appoint the other members. It provided that there should be one public school for boys, and one for girls in every town of 500 inhabitants, and more schools for larger populations. In smaller towns "incomplete" schools (i. e, schools with less than 35 pupils) are provided. It made attendance compulsory under penalty of a fine of from $5 to $25, provided for the payment of teachers, for superintendence and inspection of the schools, free text-books, and other details. The course of study is prescribed by the superintendent of schools, who was appointed in September, 1899. In March, 1900, there were reported 131 boards of education in the island, and 3,099 schools in operation, with 3,500 teachers and 130,000 children enrolled. In 1899 there had been only 200 schools, with an attendance of 4,000. The expenditures up to the end of March, 1900, had been $3,500,000, the school fund being taken from the customs receipts, and the estimate for 1900 was $4,000,000. Harvard University assumed the expense of bringing over 281 Cuban teachers to Cambridge in July, 1900, and offered free courses of instruction in history, botany, geography, English, kindergarten work, etc. The teachers were brought under the superintendence of Alexis E. Frye, superintendent of schools in Cuba.

Postal Frauds.—Serious postal frauds in Havana on the part of American officials were discovered in April, 1900, and on the 16th of May, E. P. Thompson, postmaster of Havana, confessed that he had in September, 1899, taken $435 from the money-order funds, and left a memorandum of the act as a receipt for the money. At the regular times for inspection this sum was replaced by money taken from funds that would not have to be accounted for until later. This deception was discovered by the inspector in April, and the deficit was made good. Postmaster Thompson made a sworn statement detailing the irregularity in his department, and also pointed out some other irregularities. As a result, W. H. Reeves, deputy auditor of the island, and Edward Moya and Jorge Mascaro, clerks in the stamp

department, were arrested and lodged in prison. Reeves confessed, and implicated C. F. W. Neely, chief financial agent of the Cuban postal service. The former turned over $4,500 which Neely had given him as a bribe.

As soon as the frauds were discovered, Mr. Bristow, fourth assistant postmaster-general of the United States, was sent to make an investigation of the affairs of the postoffice department of Cuba. He reported Neely's defalcations amounted to $131,713, without including postage stamps taken, and which might have been sold, amounting to from $50,000 to $100,000. In the meantime Neely was arrested in Rochester, N. Y., and was held for extradition to Cuba.

The matter came up in Congress, and Senator Teller moved that an appropriation of $200,000 be made to cover the defalcations. The house also received a bill providing for the extradition of Neely, which was amended to permit the extradition of criminals to "any foreign country or territory or part thereof occupied by the United States" Later he was taken to Havana to await trial there.

The methods used in bringing the criminals to justice was highly commended by the Cuban press. The *Cubano,* one of the leading papers of Havana, commented upon the affair as follows: "Cuba is not primarily interested, but she looks to see what the United States will do. Fraud is not the monopoly of any nation, and there is a great difference between the frauds of the postoffice and those committed under the Spanish régime. Now thorough investigation is being made, with a view to punishing the criminals. In former days the criminals went scot free. The Americans are proving themselves more honest than the government which ruled Cuba for four hundred years."

New Governor-General. — On the 6th of December, 1899, General Leonard Wood, governor of the province of Santiago, was promoted to be a major-general, and appointed governor-general of Cuba to succeed Major-General Brooke, who had been governor-general since the island had been evacuated by the Spaniards. General Wood appointed a cabinet as follows: —

Secretary of State, Diego Tamayo.
Secretary of Justice, Luis Estevoz.
Secretary of Education, Juan B. Hernandez.
Secretary of Finance, Enrique Varona.
Secretary of Public Works, Jose R. Villalon.
Secretary of Agriculture, Ruis Rivera.

Shortly after assuming office the governor-general issued an order defining the relations between civil and military authorities. In the conduct of civil affairs the military authorities are not to interfere, except in matters of sanitation and the prisons, though the military authorities have the right of general supervision, also the control of the Rural Guard.

The prisons next attracted the attention of General Wood. He found the Carcel, the central prison at Havana, crowded with many

Cuba

hundreds of criminals of all grades, and of persons awaiting trial, huddled together indiscriminately, and living in indescribable squalor and filth. These were mostly men who had been imprisoned without trial, and who already had been incarcerated for terms longer than the laws prescribed. This building from the outside gave the idea of neatness and cleanliness, and was of no mean architectural pretension. General Wood promptly removed from office Federico Mora, Fiscal of the Supreme Court, as it was shown that he was largely responsible for the state of affairs existing in the prison, especially for the large number of untried cases. A commission of American and native lawyers was then appointed to codify the existing laws of the island, and modify them in so far as they restrict personal liberty, and especially to devise means of guaranteeing prompt trial to accused persons. Many of the evils existing in the custom house were also remedied by the removal of Señor Mora, as he had tried to block the charges against officials in the customs service. General Wood "caused it to be known that he expected the Cuban judiciary to vindicate itself from the insinuation that it could be influenced by corrupt political motives."

Steps toward Independence. — The census having been completed, and the period given for Spanish residents to make their election as to citizenship having expired on the 11th of April, 1900, steps were immediately taken for the election of municipal governments by the people. In view of the fact that sixty-six per cent of the people could not read and write, it was not deemed advisable that absolutely unrestricted suffrage should be established. It was finally agreed that every native male Cuban or Spaniard who had elected to take Cuban citizenship, of full age, might vote if he either could read and write, or owned real estate or personal property to the value of $250, or had served in and been honorably discharged from the Cuban army. On the 18th of April an election law was promulgated for the guidance of the proposed election, and on the 16th of June an election was held throughout the island, in which the people elected all their municipal officers. The boards of registration and election were composed of Cubans selected by the Cubans themselves. The election passed off quietly.

After the newly elected municipal officers had been installed and commenced the performance of their duties, an order was made enlarging the powers of the municipal governments and putting into their hands as much of the government of the people as was practicable. On the 25th of July the governor-general published the call for a constitutional convention, ordering "that a general election be held in the island of Cuba, on the third Saturday of September, 1900, to elect delegates to a convention to meet in the city of Habana, on the first Monday in November, to frame and adopt a constitution for the people of Cuba, and, as a part thereof, to provide for and agree

with the government of the United States upon the relations to exist between that government and the government of Cuba, and to provide for the election by the people, of officers under such constitution, and the transfer of government to the officers so elected."

The number of delegates from each province, proportionate to their populations as determined by the census, was as follows: Pinar del Rio, three; Habana, eight; Matanzas, four; Santa Clara, seven; Puerto Principe, two; and Santiago de Cuba, seven.

The election was duly held, and the delegates met in the city of Havana November 5. The convention was opened by the military governor, who made the following statement:—

"*To the Delegates of the Constitutional Convention of Cuba.*

Gentlemen: As military governor of the island, representing the President of the United States, I call this convention to order. It will be your duty, first, to frame and adopt a constitution for Cuba, and when that has been done, to formulate what, in your opinion, ought to be the relations between Cuba and the United States. The constitution must be adequate to secure a stable, orderly, and free government. When you have formulated the relations which, in your opinion, ought to exist between Cuba and the United States, the government of the United States will doubtless take such action on its part as shall lead to a final and authoritative agreement between the people of the two countries to the promotion of their common interests. * * * Under the order pursuant to which you have been elected and convened, you have no duty and no authority to take part in the present government of the island. Your powers are strictly limited by the terms of that order."

In February, 1901, the convention adopted a constitution of 26 sections similar to the U. S. constitution. The work of formulating relations between Cuba and the U. S. was next taken up. While the matter was under discussion, congress adopted a resolution setting forth the desires of the U. S. as follows: Cuba to sell or lease coaling-stations to the U. S.; the Cuban constitution not to extend to the Isle of Pines; the U. S. to insist upon the maintenance of good sanitary conditions in Cuba; the acts of the U. S. during its period of occupancy to be respected; and protection to be accorded to all rights growing out of such acts; Cuba is not to contract any debts beyond the limits of her financial ability; nor to place herself by treaty or otherwise under foreign control; the U. S. reserves the right to intervene if the Cuban government cannot protect life and property, maintain its authority, or fulfill the international obligations that the U. S. assumed in the Treaty of Paris. This resolution met mith considerable opposition in the convention, and a committee of delegates was sent to Washington in May, 1901, to seek a modification of it. As congress had adjourned of course no action could be taken.

Cubebs, the fruit of species of plants belonging to the genus Cubeba. The cubebs of pharmacy are produced by a climbing woody shrub indigenous to South Borneo, Sumatra, Prince of Wales Island and Java. It has round, ash-colored, smooth branches. The fruits are small, globose, about one-fifth inch in diameter. Forty to fifty of them are borne on a single branch. Commercial cubebs consist of the dried ripe berries, usually with their pedacles attached. The odor of cubebs is agreeable and aromatic; the taste pungent, acrid, slightly bitterish, and persistent. About 15 per cent. of a volatile oil is obtained by distilling cubebs with water.

Cuck'oo, a scansorial or climbing bird, the type of the family Cuculidæ. The note from which it derives its name is a love call used only in the mating season. The greater number of species belonging to the genus are confined to summer countries, more especially India and Africa, though some are summer visitants of colder climates. The adult bird is ashy-gray, with a white breast barred across with narrow lines of grayish black; tail spotted and barred with white; bill black, touched at the gape with yellow; eyes and feet yellow. It appears in England about the middle of April, and in May begins to deposit its eggs in the nests of other species; giving the preference to those of the hedge sparrow, meadow pipit, or pied wagtail.

Cuckoo.

The young cuckoo ejects from the nest its young companions, and monopolizes the attentions of its foster parents, which feed it for about five weeks after it is fledged. The young birds do not leave the country until the end of August or even September; but the adult birds commence their flight southward in July or at latest early in August. Their food consists chiefly of cockchafers, moths, dragon flies, and caterpillars, though young cuckoos will sometimes eat berries. There appears to be a curious preponderance of male as compared with female birds, a low estimate putting the ratio at about five to one.

Cu'cumber, the fruit of *Cucŭmis satīvus*, or the plant itself, belonging to the Cucurbitaceæ or gourd order, and supposed to have been originally imported into Europe from the Levant. It is an annual with rough trailing stems, large angular leaves, and yellow male

1

2a

2b

1. Red-billed Brazilian Cuckoo.
2. Large-billed Brazilian Cuckoo; *a* male, *b* female.

3. The Hornbill or Annual Bird.

4. The Roller, species of Crow

5. Long-tailed Trogan or Ouesal.

and female flowers set in the axils of the leaf stalks.

Cucumber Tree, a fine forest tree, so named from the appearance of its fruit.

Cucurbita′ceæ, the gourd order, consisting of large herbaceous plants, annual or perennial, with alternate leaves palmately veined and scabrous, and unisexual flowers. The corolla is monopetalous, regular, and with five lobes; the petals, usually either yellow, white, or green, and deeply veined; the fruit fleshy and succulent. The stems are scabrous, and the general habit is climbing or trailing, by means of tendrils. The order contains at least fifty-six genera and about 300 known species, and abounds in useful or remarkable plants, including the melon, gourd, cucumber, colocynth, bryony, etc. They are natives of both hemispheres, chiefly within the tropics. The annuals, however, are common in our gardens.

Cuddalore′ (or Kúdalúr), a maritime town in Hindustan, presidency of Madras and district of South Arcot, 86 mi. s. of Madras. It was formerly a place of great strength and importance, and still carries on a large land trade with Madras in indigo, oils, and sugar. It also exports grain and rice. Pop. 43,545.

Cud′dapah (or Kadapa), a district and town, Hindustan, presidency Madras. The district, of which the area is 8,745 sq. mi., is traversed north to south by the Eastern Ghauts, and watered by the Pennar and its affluents. The forests contain much valuable timber, and the minerals include iron ore, lead, copper, diamonds, etc. Agriculture is in a flourishing condition, grain, cotton, and indigo being largely grown. Pop. 1,121,038. The town lies on a small river of same name, an affluent of the Pennar, 140 mi. n. w. Madras. It exports indigo and cotton. Pop. 18,982.

Cuen′ca, a town of Ecuador, next to Quito the most important in the country, with a cathedral and university. Pop. 30,000.

Cufic, a term derived from the town of Cufa or Kufa, in the pashalic of Bagdad, and applied to a certain class of Arabic written characters. The Cufic characters were the written characters of the Arabian alphabet in use from about the sixth century of the Christian era until about the eleventh. They are said to have been invented at Cufa, and were in use at the time of the composition of the *Koran.*

Culloden Moor, a heath in Scotland, 4 mi. e. of Inverness, celebrated for the victory obtained April 27, 1746 by the Duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The battle was the last fought on British soil, and the termination of the attempts of the Stuart family to recover the throne of England.

Cullom, Shelby M., statesman b. in Wayne co., Ky. 1829; studied law and practised at Springfield, Ill. In 1876 he became governor of Ill. He was elected U. S. senator in 1883, which position he still holds.

Cullum, George W., engineer, b. in New York City, 1809, graduated at West Point in 1833 and entered the engineer corps. He built Fort Sumter and other harbor defenses. D. 1892.

Cu′mæ, a very ancient city of Italy, in Campania, the oldest colony of the Greeks in Italy, founded about 1030 B.C. by colonists from Chalcis, in Eubœa, and from Cyme in Asia Minor. It founded Naples, and in Sicily Zancle or Messina. In 420 B.C. Cumæ was taken by the Campanians, and came with them under the power of Rome (345 B.C.). It was destroyed A. D. 1207, and a few ruins only now exist.

Cumana′, a town of Venezuela. It is the oldest European city in the New World, having been founded in 1523. It lies near the mouth of the Gulf of Cariaco, and has a good roadstead in Cumana Bay, with a trade in cacao, sugar, tobacco, etc. Pop. 12,051.

Cum′berland, the extreme northwestern county of England. Area 970,161 acres. Carlisle is the county town; the other principal towns are the seaports Whitehaven, Workington, and Maryport; and the inland towns Penrith, Cockermouth, and Keswick. Pop. 266,550.

Cumberland, Providence co., R. I.; a manufacturing town. Pop. 8,090.

Cumberland, Alleghany co., Md., on Potomac River, 150 mi. from Washington. Railroads: B. & O.; Pennsylvania; C. & P.; W. Va. C. & P.; and G. C. & C. Industries: railroad shops, four flouring mills, three iron foundries, three glass, three cement, steel shafting, and tin plate factories. Surrounding country agricultural and mineral. Fort Necessity was established by General Washington—destroyed by French in 1754, and Fort Cumberland garrisoned 1754–55. 1787 a survey of Cumberland was ordered, and in 1876 George Dent (father-in-law of General Grant) made a plat of the town. In 1815 the town was incorporated, and in 1816 the first city council was elected. Pop. 1900, 17,128.

Cumberland, a river of the U. S. which runs through Kentucky and Tennessee into the Ohio, having a course of about 600 mi., navigable for steamboats to Nashville, nearly 200 mi.

Cumberland Mountains, in Tennessee part of a range of the Appalachian system; rarely exceeding 2,000 ft. in height.

Cum′in (or Cum′min), an umbelliferous plant which grows wild in Egypt and Syria, and is largely cultivated in Sicily and Malta, whence it is exported. The fruit, called cumin seeds, is of a light brown color, with an aromatic smell and caraway-like taste, and possesses stimulating and carminative properties.

Cumminsville, Hamilton co., O., near Ohio River, 5 mi. n. and part of city of Cincinnati by annexation. Railroads: C. H. & D.; Dayton Short Line; B. & O.; and three lines of Cincinnati street railway. Industries: two flouring mills, shoe, pearl button, harness, cigar, and other small factories. Surrounding country agricultural. The town was first settled in 1788; it was the scene of "Mad Anthony" Wayne's battles with the Indians in the early days.

Cundinamarca, one of the departments of the Republic of Colombia. Area est. 79,810 sq. mi.; pop. 537,658.

Cune′iform Inscriptions, the name applied to the wedge-shaped characters of the inscriptions on old Babylon and Persian monuments; sometimes also described as *arrow-headed* or *nail-headed* characters. They appear to have been originally of the nature of hieroglyphs, and to have been invented by the primitive Accadian inhabitants of Chaldea, from whom they were borrowed with considerable modification by the conquering Babylonians and Assyrians, who were Semites by race and spoke an entirely different language. The use of the character, however, ceased shortly after the reign of Alexander the Great; and after the lapse of nearly two thousand years it was doubted by many if the signs had ever had an intelligible meaning. They were even regarded by some as the work of a species of worm, by others as mere talismanic signs, astrological symbols, and the like. The first hints toward decipherment were given by Karstens Niebuhr late in the eighteenth century; and the labors of Grotefend, Rask, Burnouf, Lassen, Rawlinson, and other investigators slowly perfected the means of translation. Most of the inscriptions first discovered were in three different languages and as many varieties of cuneiform writing, the most prominent, and at the same time the simplest and latest, being the Persian cuneiform writing with about sixty letters. Next older in time and much more complex is what is designated the Assyrian or Babylonian system of writing, consisting of from 600 to 700 characters, partly alphabetic, partly syllabic, or representing sound groups. Lastly comes the Accadian inscriptions, the oldest of all, originally proceeding from a people who had reached a high state of civilization three thousand years before Christ, and whose language (allied to Turkish) ceased to be a living tongue about 1700 B.C. The most celebrated trilingual inscription is that at Behistun, cut upon the face of a rock 1,700 ft. high, and recording a portion of the history of Darius. The British Museum contains many thousands of inscribed clay tablets, cylinders, prisms, etc., the decipherment of which is in progress. See also *Assyria.*

Cu′pola, in architecture, a spherical vault on the top of an edifice; a dome or the round top of a dome. The Italian word *cupola* signifies a hemispherical roof which covers a circular building, like the Pantheon at Rome and the Round Temple of Vesta at Tivoli. The term is also applied distinctively to the concave interior as opposed to the dome forming its exterior.

Cupping, a surgical operation consisting in the application of the cupping-glass in cases where it is desirable to abstract blood from, or draw it to, a particular part. When blood is removed the operation is simply termed *cupping;* when no blood is abstracted, it is *dry-cupping.* The cupping-glass, a cup-shaped glass vessel, is first held over the flame of a spirit lamp, by which means the included air is rarefied. In this state it is applied to the skin, and as the heated air cools it contracts and produces a partial vacuum, so that the skin and

integuments are drawn up slightly into the glass and become swollen. If blood is to be drawn, a scarificator or spring-lancet is generally used.

Curaçoa (kö-rȧ-so′a), an island, Dutch West Indies, Caribbean Sea, 46 mi. n. the coast of Venezuela; 36 mi. long and 8 mi., broad; capital Willemstad, principal harbor Santa Anna. It is hilly, wild, and barren, with a hot, dry climate. Yellow fever visits it every sixth or seventh year. Fresh water is scarce, and serious droughts occur. The tamarind, cocoa-palm, banana, and other useful trees are reared —among them three varieties of orange, from one of which the Curaçoa liquor is made. Sugar, tobacco, cochineal, and maize are also produced, but the staple exports are salt, and a valuable phosphate of lime used as a manure in its natural state, or made to yield valuable superphosphates. The islands of Curaçoa, Bonaire, Oruba (or Aruba), and Little Curaçoa, form a Dutch government, the residence of the governor being at Willemstad. From the sixteenth century Curaçoa was held in succession by the Spaniards, Dutch, and British, and finally ceded to Holland at the general peace in 1814. Pop. 25,421; including the dependencies, 44,734.

Curaçoa (or Curaçao), a liquor or cordial prepared from a peculiar kind of bitter oranges growing in Curaçoa, which have a persistent aromatic odor and taste. It is prepared from the yellow part of the rind, which is steeped in strong alcohol, the infusion being afterward distilled and rectified and mixed with syrup. For the true orange, the common bitter orange of Europe is often substituted, and the genuine deep-yellow color imitated by caramel, etc.

Cu′rari (Cu′rara, Urara, Woorali), the well-known arrow poison of the Indians in Spanish Guiana and in Northern Brazil. It is the aqueous extract of a tree, the *Strych nos toxifĕra,* thickened with a mucilaginous matter; and its properties are such that if introduced into a scratch or puncture of the skin, so as to mix with the blood, it causes death by paralysis of the nerves of the respiratory organs. It may, however, be introduced in moderate doses into the alimentary canal without injury, and animals killed by it are wholesome as food. The active principle is called *curarin.*

Curas′sow (or Hocco), the name given to gallinaceous birds of the genus *Crax,* family Cracidæ; natives of the warm parts of America. The crested curassow, found in Guiana, Mexico, and Brazil, is a handsome bird, nearly as large as the turkey and more imposing in appearance, being of a dark violet color, with a purplish-green gloss above and on the breast; the abdomen is snow white, and the crest golden. Another species is the red curassow, also a native of South America, and about the size of a turkey. The cushew bird is called the galeated curassow.

Curbroof, in architecture, a roof in which the rafters, instead of continuing straight down from the ridge to the walls, are at a given height received on plates, which in their turn are supported by rafters less inclined to the

horizon, so that this kind of roof presents a bent appearance, whence its name.

Curb-sender, an automatic signaling apparatus used in submarine telegraphy. The message is punched on a paper ribbon, which is then passed through the transmitting apparatus by clockwork. The name is due to the fact that when a current of one kind of electricity is sent by the instrument, another of the opposite kind is sent immediately after

Crested Curassow.

to curb the first, the effect of the second transmission being to make the indication produced by the first sharp and distinct, instead of slow and uncertain.

Cur'few, a practise originated in England by William the Conqueror, who directed that at the ringing of the bell at eight o'clock all fires and lights should be extinguished. The law was repealed by Henry I in 1100, but the bell continued to be rung in many districts to modern times, and probably may still be heard. Similar ordinances for keeping children off the streets have been passed in some of our American cities. The name was also given formerly to a domestic utensil for covering up a fire.

Curlew, a genus of birds belonging to the order Grallatores, or Waders, and of the same family as the snipe and woodcock. The genus

Common Curlew.

is characterized by a very long, slender, and arcuated bill, tall and partly naked legs, and a short somewhat rounded tail. The bill is more or less covered with a soft sensitive skin by

which the bird is enabled to detect its food in the mud.

Curling, a favorite Scottish winter amusement on the ice, in which contending parties slide large smooth stones having somewhat the shape of a flattened hemisphere, weighing from 30 to 45 lbs. each, with an iron or wooden handle at the top, from one mark to another. The object of the player is to lay his stone as near to the mark as possible, to guard that of his partner which has been well laid before, or to strike off that of his antagonist.

Curling Stone.

Curr'agh, a plain or common in Ireland, Kildare county, the property of the crown and the site of the chief military encampment in Ireland, formed in 1855, and having accommodation for 12,000 troops.

Cur'ran, JOHN PHILPOT (1750–1817), Irish advocate and politician. His eloquence, wit, and ability made him the most popular advocate of his age and country.

Cur'rant, the name of two well-known shrubs, order Grossulariaceæ, cultivated in gardens for their fruit. The red currant, *Ribes rubrum*, the fruit of which is used principally for tarts and jellies, is a native of Southern Europe, Asia, and North America. The white currant is a cultivated variety of the red, and is used chiefly for dessert and for conversion into wine. The black currant, *R. nigrum*, a native to most parts of Europe, and found abundantly in Russia and Siberia, is used for tarts and puddings, and for a fine jelly recommended in cases of sore throat.

Red Currant.

Currants, a small kind of dried grape imported from the Levant, chiefly from the vicinity of Patras in the Morea, as also from Zante, Cephalonia, and Ithaca, of which islands they are the staple produce. The plant is delicate and the crop precarious, and as the plantation must be six or seven years old before it bears, its cultivation requires a great outlay of capital. After being dried the currants are exported in large butts.

Currency

Currency, any medium of exchange by which the processes of trade are facilitated. Originally all exchanges may be supposed to have been made directly by barter, one commodity being exchanged against another according to the conveniences of the particular holders. In barter, however, it would obviously be often difficult to find two persons whose disposable goods suited each other's needs, and there would also arise difficulties in the way of estimating the terms of exchange between unlike things, and of subdividing many kinds of goods in the barter of objects of different value. To obviate these some special commodities in general esteem and demand would be chosen as a medium of exchange and common measure of value, the selection varying with the conditions of social life. In the hunting state furs and skins have been employed by many nations; in the pastoral state sheep and cattle are the chief negotiable property. Articles of ornament, corn, nuts, olive oil, and other vegetable products, cotton cloth, straw mats, salt, cubes of gum, beeswax, etc., have all been at various times employed to facilitate exchange. These, however, while removing some of the difficulties attendant upon barter, would only partially solve others. It would be felt by degrees that any satisfactory medium must not only possess utility and value, but it must be portable, not easily destructible, homogeneous, readily divisible, stable in value, and cognizable without great difficulty. The metals would naturally commend themselves as best satisfying these requirements, and accordingly in all historic ages gold, silver, copper, tin, lead, and iron have been the most frequent materials of currency. The primitive method of circulating them appears to have consisted simply in buying and selling them against other commodities by a rough estimation of the weight or size of the portions of metal. Sometimes the metal was in its native state (e. g. rough copper or alluvial gold dust), at others in the form of bars or spikes, the first approximation to a coinage being probably rudely-shaped rings. The earliest money was stamped on one side only, and rather of the nature of stamped ingots than coins as we know them. The chief desiderata influencing the subsequent development of coinage were the prevention of counterfeiting, the prevention of any fraudulent subtraction of metal from the coin, the removal as far as possible of anything likely to occasion loss of metal in the wear and tear of usage, and the production of an artistic and historical monument of the state issuing the coin. Hence the elaboration of designs to cover the whole of a given portion of metal, and the nicer determination of quality, size, degree of relief, inscription, etc. While, however, metallic money of a guaranteed standard value was at an early period found to facilitate in a high degree the mechanism of exchange, it was speedily discovered that it was possible in large part to replace the standard gold, or silver, or copper coins by various forms of currency of a representative character. The standard money depended solely for its value in exchange upon the value of the material of which it was composed; its metallic value and its nominal value were coincident; the representative money derived its value from a theoretic convertibility at will into the standard coin. Thus in token coins the metallic value may be much less than the nominal value, which is defined by the fact that they can either by force of law, or custom be exchanged in a certain fixed ratio for standard coins. Gradually a series of devices came to be employed to further the interchange of commodities with the least friction and the least possible actual use of the coinage except as a standard and common denominator of value in terms of which exchanges were made. Even in home transactions, but especially in international transactions, the use of actual specie was found to involve a loss of interest and a risk of still more serious loss, and a paper currency based upon credit offered the readiest solution of the difficulty. In this way bank notes, bills of exchange, and checks—warrants or representative documents convertible, if desired, into standard coin—took their place alongside the metallic currency, partly displacing it, partly extending and supplementing it.

The requisites of circulation are that the monetary issues, whether of coin or paper, shall be from a recognized or official source, and that they admit of being freely returned when necessary, to the source from which they are issued. The certification of the fineness of the masses of metal circulating in a community, and the protection from adulteration and fraud, clearly falls among the necessary acts of police. It is still argued, as by Herbert Spencer in his *Social Statics*, that the coinage should be left to the ordinary competition of manufacturers and traders; but when this has occurred the currency has uniformly become debased, and it is generally held, in accordance with the maxims of civil and constitutional law, that the right of coining is a prerogative of the crown. Even in the case of state issues base money has been circulated. In the matter of state supervision two precautions are particularly necessary; that the standard coins shall be issued as nearly as possible of the standard weight, and that all coin worn below the least legal weight shall be withdrawn from circulation. The ground for these precautions is to be found in the broad, general principle relating to the circulation of money, that bad money invariably drives good money out of circulation, the heaviest coins being selected for exporting, hoarding, melting, conversion into jewelry, gold leaf, etc. The law holds good not only with regard to coins in one kind of metal, but to all kind of money in the same circulation, the relatively cheaper medium of exchange being retained in circulation while the other disappears. Of the various systems of metallic currency, the first adopted was that known as the single-legal-tender system, in which the state issued certified coins in one metal only. It was found, however, that in such cases the people invariably circu-

lated, for convenience, coins of other metals, and there naturally arose out of this the adoption of a double or multiple legal tender system, in which coins were issued in different metals at a fixed rate of exchange. To obviate difficulties arising from the possession of two or more metals as concurrent standards of value, with the constant tendency of one or other to become more valuable as metal than as currency, a third system, the composite-legal-tender, came into existence, in which coins of one metal were adopted as the standard of value, and token coins only issued in the other metals for the payment of small amounts. The double-legal-tender system is adhered to in the U. S.

The circulation of representative money differs from that of standard metallic money in that it only circulates within the district or country where it is legally or habitually current. In the payment of debts to foreign merchants the only money which can be exported is standard metallic money. Examples of this are to be found in the suspension of specie payments by the Bank of England between 1797 and 1819, and in the history of the French assignats at the time of the Revolution. The various methods on which the issue of paper money may be conducted are exceedingly numerous and a matter of interminable debate. The state may either constitute itself the sole issuer of representative money on the same lines as it constitutes itself the sole issuer of metallic money, or it may allow corporations, companies, or private individuals to issue representative money under legislative control.

The question as to the duty of a government in this respect has been much obscured by the want of a clear apprehension of the distinction between a real and a nominal currency. Another idea, that the issue of paper money ought to be wholly controlled by government, or ought to rest entirely upon government credit, places a high degree of faith in the trustworthiness of governments, and is held by many to misconceive the nature and objects of a paper currency.

Currentom′eter (Current Gauge), an instrument for measuring the velocity of currents. It may be constructed in various ways, e. g., a simple tube which is bent and has its lower end open to the current, the ascension of water in the vertical part indicating the velocity of the current.

Currents, Marine, masses of sea water flowing or moving forward in the manner of a great stream. They are phenomena of the highest importance, both on account of their influence upon the climate of many maritime regions—an influence often reaching far inland—and their practical relation to the art of navigation. These currents are very numerous, and taken together constitute an oceanic circulation the intricacy and irregularity of whose form is owing to the number and variety of the agencies at work. Among the theories which have been put forward to account for the existence of currents, the chief place belongs to the theory of a circuit maintained

between equatorial and polar waters. According to this theory there is in either hemisphere an area within which the waters of the ocean are colder, and hence by many degrees denser, than within the belt of the tropics. The natural result is a tendency of the colder and heavier water to sink and to diffuse itself over the lower portion of the ocean bed, and a movement of the warmer and lighter water in the direction of the surface, over which it tends to become diffused. In other words, the colder waters will move beneath the surface in the direction of the equator, and the warmer waters will flow along the surface in the direction of either pole. Hence, in either half of the globe two great and opposite currents—a *cold* current flowing from the pole toward the equator, and a *warm* current flowing from the equator in the direction of the pole. This theory has been excellently illustrated by Dr. Carpenter's experiment, in which a trough of glass filled with water, and having a lump of ice at one end and a heated bar of iron at the other, exhibits a similar circulation of hot and cold currents. To this theory Sir C. Wyville Thomson opposed a theory of evaporation as the general cause of the movement, holding that in the Antarctic Ocean at least the return of moisture to the south to balance the cold indraught of water that comes from thence takes place in a large measure through the atmosphere. Another great general cause of currents is to be found in the axial rotation of the earth eastward, by which the movement of tropical waters toward the pole is deflected eastward, and becomes in the northern hemisphere a northeastwardly current and in the southern a southeastwardly one. Under the operation of the same laws the opposite currents from polar latitudes to the equator are deflected in southwesterly and northwesterly directions respectively. It is to such influences that we may in the main attribute the well-known differences between the climates of North America and Europe within correspondent parallels. Other causes, more local in their nature, must be looked for to explain the origin and direction of currents in particular cases. In the case of surface or drift currents, for instance, it is probable that these are largely caused by the action of winds. Thus it is to the constant drift of surface water to the westward under the influence of the tradewind that the equatorial currents of the Atlantic and Pacific are due. In the case of the Atlantic Ocean the westward-moving waters, encountering the eastward extension of the South American mainland, become of necessity divided into two streams, the one of which sets to the southward along the eastern coast of Brazil, while the other advances along the more northwardly portions of the South American continent, past the outlets of the Amazon and the Orinoco, and thence into the Caribbean Sea. From the latter land-enclosed basin its course is necessarily into the similarly shut in basin of the Mexican Gulf, whence it finally emerges through the narrow channel of Florida as the well-known Gulf Stream (which

see). In the case of the Pacific Ocean there exists no such unbroken land barrier to the westwardly progress of the equatorial waters. A portion of its equatorial stream, however, is deflected to the northward toward the coasts of Japan (where it forms the well-known Japan stream, setting to the northeastward, past the Kuriles, in the direction of the Aleutian Islands), while another portion turns southwardly in the direction of Australia and New Zealand. To the same action of the winds, operating in connection with the obstacles presented by the land, divergent and countercurrents are due. Thus in the Atlantic and the Pacific there flows between the two equatorial trade-wind currents a countercurrent in exactly the opposite direction, and there is a similar countercurrent in the Indian Ocean north of its sole trade-wind current. Currents called *indraught currents* are also caused by the flow of water to replace that taken away by currents due to causes already mentioned. An example of this is found on the west coast of Africa, where an indraught current replaces the water blown toward the coast of South America. In the case of inland seas evaporation determines the direction of the surface currents, the direction being inward, where, as in the Mediterranean, the evaporation exceeds the inflow of fresh water; and outward, as in the Baltic and the Black Sea, where there is an opposite state of matters.

Currying is the art of dressing cowhides, calves' skins, sealskins, etc., principally for shoes, saddlery, or harness, after they have come from the tanner. In dressing leather for shoes the leather is first soaked in water until it is thoroughly wet; then the flesh side is shaved to a proper surface with a knife of peculiar construction, rectangular in form with two handles and a double edge. The leather is then thrown into the water again, scoured upon a stone till the white substance called *bloom* is forced out, then rubbed with a greasy substance and hung up to dry. When thoroughly dry it is *grained* with a toothed instrument on the flesh side and *bruised* on the grain or hair side for the purpose of softening the leather. A further process of *paring* and *graining* makes it ready for *waxing* or *coloring*, in which oil and lampblack are used on the flesh side. It is then sized, dried, and tallowed. In the process the leather is made smooth, lustrous, supple, and waterproof.

Curso'res (or Runner), an order of birds, which includes the ostrich, rhea, emu, cassowary, and apteryx. The birds of this order are distinguished by their remarkable velocity in running, the rudimentary character of their wings, which are too short to be of use for flight, and by the length and strength of their legs. The breast bone is destitute of the ridge or keel which it possesses in most birds, hence the name *Ratītæ* (*L. ratas*, a raft).

Curtin, Andrew Gregg, b. in Bellefonte, Pa., April 22, 1815. He was elected governor of Pennsylvania in 1860. In 1863 he was re-elected and in 1869 became minister to Russia. He sat in Congress from 1881 to 1887. D. 1894.

Curtis, George Ticknor, b. in Waterton, Mass., 1812; graduated at Harvard in 1832. Four years later he was admitted to the bar. He was a member of the state legislature from 1840 to 1844, and then became U. S. commissioner. He removed to New York City in 1862. His writings on commercial and copyright law are very numerous. D. 1894.

Curtis, George William (1824–1892), American author, b. in Providence, R. I.; in 1850 he joined the staff of the New York *Tribune*, and was one of the editors of *Putnam's Monthly* from 1852 to 1869. He commenced the "Editor's Easy Chair" papers in *Harper's Monthly* in 1853, and became principal leader-writer for *Harper's Weekly* on its establishment in 1857. A novel, *Trumps* (1862), and most of his books appeared first in these journals. Until 1884 he was one of the most prominent and influential members of the Republican party.

Cu'rule Magistrates, in ancient Rome, the highest dignitaries of the state, distinguished from all others by enjoying the privilege of sitting on ivory chairs when engaged in their public functions. The curule magistrates were the consuls, prætors, censors, and chief ædiles, who, to distinguish them from the plebeian ædiles, were called *curule*.

Cusco-bark (Cuzco-bark), the bark of *Cinchōna pubescens*, which comes from Cuzco, in South America, and is exported from Arequipa. It contains a peculiar alkaloid called cusco-cinchonine, or cusconine, which resembles cinchonine in its physical qualities, but differs from it in its chemical properties. When applied medicinally it excites warmth in the system, and is therefore recommended to be given in cold intermittents and low typhoid states of the system.

Cuscus, a genus of animals of the phalanger family, somewhat resembling the opossums, having a dense woolly fur, prehensile tails, and living on leaves; natives of the smaller Australian islands.

Cushing, Caleb (1800–1879), statesman, b. in Salisbury, Mass. After graduating at Harvard in 1817, he was tutor of mathematics and natural philosophy there until 1819, was admitted to the bar in 1822. In 1825–26 he served in the legislature. He was elected to Congress in 1835, serving until 1843. He was nominated by Tyler for secretary of the treasury, but was rejected by the senate. In 1843 he was made U. S. commissioner to China and negotiated a treaty which was ratified in 1845. He was elected to the legislature in 1846. In 1850 he was re-elected, and was made the first mayor of Newburyport. In 1852 he was appointed an associate justice of the Supreme Court of Massachusetts, and in 1853 was made U. S. attorney-general. In 1866 was appointed with two other jurists to revise and codify the laws of the U. S. In 1868 he was sent to the U. S. of Colombia, South America, on a diplomatic errand, and in 1870 engaged in preparing the protocol of the Treaty of Washington and afterward in the statement to be laid before the tribunal of arbitration in Geneva. In 1873

he was nominated as chief justice of the U. S. but was not confirmed by the senate, and in the same year he was made minister to Spain. In 1852 Harvard gave him the degree of LL.D. He was the author of *Reminiscences of Spain, The Country, Its People, History, and Monuments;* and *Historical and Political Review of the Late Revolution in France.* His wife published *Letters Descriptive of Public Monuments, Scenery, and Manners in France and Spain.*

Cushion Capital, a capital which has the appearance of a cushion pressed upon by the weight of its entablature, or, like the Norman capital, consisting of a cube rounded off at its lower extremities.

Cushman, CHARLOTTE S. (1816–1876), actress, was b. in Boston. She made her first appearance in opera in the Tremont Theater. As an actress she first appeared as Lady Macbeth in 1835. She was powerful in tragedy, great in Shakespearian characters. As a dramatic reader she developed remarkable ability.

Cushman, PAULINE, spy, born in New Orleans, La., 1833. At first she was a variety actress. When the war began she was employed by the U. S. government as a detective of Southern sympathizers in Louisville, Ky. For some time she posed in the Southern states as a Confederate sympathizer, but remained steadfast to her affiliations with the national government. Eventually she was captured as a Northern spy, court-martialed, and sentenced to be hanged. But when the Confederates left Shelbyville she was left behind, and became released by entrance of the Union army. Died 1893.

Cusso, a small Abyssinian tree, order Rosaceæ, yielding flowers which are imported into Europe and used as an anthelmintic.

Custis, GEORGE WASHINGTON PARKE (1781–1857), author, b. in Md. In early life he was married to Mary Lee Fitzhugh. He became a fluent speaker, wrote plays for his amusement, and finished several paintings of battles of the Revolution. He published *Recollections of Washington.*

Custer, GEN. GEORGE ARMSTRONG (1839–1876), soldier, b. in New Rumley, O. Graduated from U. S. Military Academy, 1861. He was sent from Washington with dispatches to General McDowell and took part in the first battle of Bull Run. Gen. Geo. B. McClellan was so impressed by his energy and bravery that he appointed him aid-de-camp. Captain Custer took the first colors captured by the Union army. June 29, 1863, he was appointed brigadier general of volunteers. He gained the rank of major, July 3, 1863. For gallantry at the battle of Winchester he was made brevet colonel, Sept. 19, 1864, and October 19 he was made major general of volunteers. He was made brigadier general, May 13, 1865. He served on the plains from 1866–1871. June, 1876, General Custer with his whole command was defeated and slain on the Little Big Horn (in a region almost unknown), by the confederate Sioux. The spot has become a national cemetery.

Customhouse is the house or office where vessels are entered and cleared, and where the proper customs or duties are paid.

The system of customs duties is as old as the Roman Empire, and it is even claimed that it existed in ancient Greece. It was a feature of the Venetian government in medieval days, and the customhouse of Venice had its name wrought in nails upon its great swinging door. The noted "Zollverein" was a tariff union of North German sovereignties which existed from 1818 until it was merged into the German Empire after the Franco-Prussian War. In England, while there was no doubt that customs duties were collected prior to the Norman Conquest, their more modern use dates from the long conflic between the crown and Parliament over the right of taxation. To meet the claims made by the House of Commons to the exclusive right to vote all supplies, it used to be maintained that there were certain duties on exportation and importation to which the crown had acquired a right by *custom;* and the name thus acquired was retained after the power claimed by the lower branch of Parliament had been settled by permanent legislation. The first customhouse was erected in London in 1304.

Upon the organization of our government after the close of the Revolution, the system of customs duties then in operation in England was adopted with scarcely any modification, under the direction of Alexander Hamilton, the first secretary of the treasury. Among the especial features of the system was that of debentures, or drawbacks, which were certificates entitling an exporter of imported goods to a drawback of duties paid on their importation, and also to re-export them to foreign ports. Subsequently the object thereby accomplished was more directly facilitated by permitting the importer to "bond" his goods in government warehouses until he was able to pay the duties; and later on the practise was modified still more in favor of the importer by permitting him to take out of "bond" from time to time portions of the invoice of goods consigned to him, paying the proportionate amount of duties. This system of bonded warehouses, which is now a feature of the customs service in every civilized country of the world, was embodied in an act of Congress passed in 1846, during the incumbency of the treasury department by Robert J. Walker, and known as the Walker act. It is a peculiar fact that in the colossal bonded warehouses of Hamburg, Germany, vast quantities of American whisky lie in bond, while other holders of this species of goods send it, in bond, "round the Horn" to the Pacific Coast and back, the sea voyage improving the quality of the spirits. Under our present method a credit of three years is given to importers who desire to keep their goods in bond. Realizing the immense amount of our customs system, the early secretaries of the treasury, and especially Alexander Hamilton, Albert Gallatin, Wm. H. Crawford, Richard Rush, Levi Woodbury, and Thomas Corwin, united in a policy favorable to the importer, and in

that way materially contributed to build up our commerce to the commanding position it now enjoys.

The first customhouse was established in New York City in 1799 under an act of Congress passed the previous year, and the net revenue received by the government from customs duties in the first year was so small that it is related that the collector, who with his family lived over the custom house, used the receipts of his office to pay the men employed by him. At the present time the number of customhouses in the U. S. is 152. The ten which render the largest returns to the government are, in their order, New York, Boston, Philadelphia, San Francisco, Chicago, Baltimore, New Orleans, St. Louis, Detroit, and Tampa, Florida. The amounts of net revenue received by the government through these customhouses for the year 1900 are as follows:

New York	$153,253,780.76
Boston	18,868,908.57
Philadelphia	20,266,061.81
San Francisco	7,083,942.52
Chicago	7,953,551.56
Baltimore	2,849,565.53
New Orleans	6,843,682.24
St. Louis	1,511,005.21
Detroit	1,003,712.74
Tampa	636,062.03

The customhouse in Tampa was established by an act of Congress Feb. 28, 1887, since which she has outstripped many of the leading cities of the country.

The net revenues received by the government through the customhouses of the country since the organization of the revenue system, are by decades as follows:

From 1791 to 1800	$ 50,321,485.87
" 1801 to 1810	129,540,517.63
" 1811 to 1820	163,804,167.09
" 1821 to 1830	198,523,207.69
" 1831 to 1840	204,703,913.92
" 1841 to 1850	243,666,681.78
" 1851 to 1860	544,980,470.30
" 1861 to 1870	1,239,458,442.34
" 1871 to 1880	1,663,973,043.74
" 1881 to 1890	1,992,600,748.76
" 1891 to 1900	1,824,538,519.00
Total	$8,156,111,198.99

NOTE.—In accordance with an act passed by Congress in 1842, the fiscal year since that time has begun on the first of July. Therefore the decade from 1841 to 1851 in the above list, embraces only nine and a half years.

Cutch, a state in the west of India, lying to the south of Sind, under British protection; area 6,500 sq. mi. During the rainy season it is wholly insulated by water, the vast salt morass of the Rann separating it on the north and east from Sind and the Guicowar's Dominions. Its southern side is formed by the Gulf of Cutch, and on the west it has the Arabian Sea. The country is subject to violent volcanic action. The date is the only fruit which

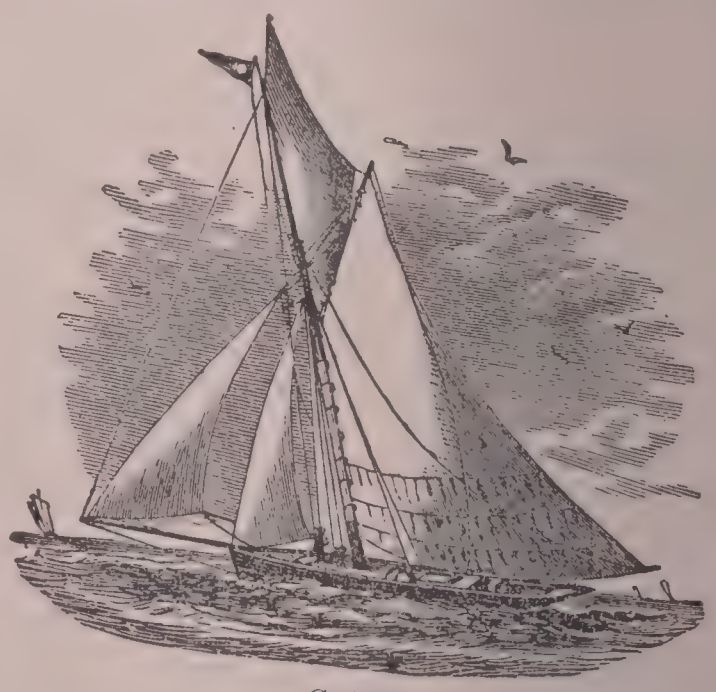
thrives, and the principal exports are cotton and horses. Pop. 512,084.

Cutch Gunda'va, a division of Beloochistan, in the northeast; area 10,000 sq. mi.; pop. 100,000.

Cutlery, a term applied to all cutting instruments made of steel. The finer articles, such as the best scissors, penknives, razors, and lancets are made of cast steel. Table knives, plane irons, and chisels of a very superior kind are made of shear steel, while common steel is wrought up into ordinary cutlery. One of the commonest articles of cutlery, a common razor, is made as follows: The workman, being furnished with a bar of cast steel, forges his blade from it. After being brought into true shape by filing, the blade is exposed to a cherry-red heat, and instantly quenched in cold water. The blade is then tempered by first brightening one side and then heating it over a fire free from flame and smoke, until the bright surface acquires a straw color (or it may be tempered differently). It is again quenched, and is then ready for being ground and polished.

Cuttack, a town of Hindustan, in Orissa, 230 mi. s.s.w. Calcutta. It is known mainly for its beautiful filigree work in gold and silver. Pop. 51,000. The district of Cuttack has an area of 3,517 sq. mi. It is well watered, and rice, pulse, sugar, spices, dye stuffs, etc., are grown along the coast, which is low and marshy, and wheat and maize in the hilly regions. On the coast salt is extensively manufactured. Pop. 1,738,165.

Cutter, a small vessel, furnished with one mast, and a straight running bowsprit which



Cutter.

may be run in upon deck. It differs from the sloop in having no stay to support its jib.

Cuvier (küv-yā), GEORGES LÉOPOLD CHRÉTIEN FRÉDÉRIC DAGOBERT, BARON (1769–1832), a distinguished modern naturalist, was b. at Montbéliard, then belonging to the duchy of Würtemberg. His lectures on natural history, distinguished not less for the elegance of their style than for profound knowledge and elevated speculation, were attended by all the accomplished society of Paris. In January,

1800, he was appointed to the Collége de France. Under Napoleon, who fully recognized his merits, Cuvier held important offices in the department of public instruction. In 1819 he was received among the forty members of the French Academy.

Cuzco, an ancient city in Peru, capital of a department of the same name, is situated in a wide valley about 11,300 ft. above sea level, between the Apurimac and Urubamba. The ruins of the fortress built by the Incas, a stupendous specimen of cyclopean architecture, are still to be seen, as well as other massive specimens of ancient Peruvian architecture. The inhabitants manufacture sugar, soap, cotton, woolen goods, etc. There is a university, a cathedral, etc. Cuzco is the most ancient of the Peruvian cities, and was at one time the capital of the empire of the Incas. In 1534 it was taken by Pizarro. Pop. 18,730. Area of the department 95,547 sq. mi.; pop. 238,445.

Cy′anite (or Kyanite), a mineral of the garnet family found both massive and in regular crystals. Its prevailing color is blue, but of varying shades. Found only in primitive rocks.

Cyan′ogen, a compound radical composed of one atom of carbon and one of nitrogen. It is a gas of a strong and peculiar odor, resembling that of crushed peach leaves, and burning with a rich purple flame. It is unrespirable and highly poisonous. It unites with oxygen, hydrogen, and most non-metallic elements, and also with the metals, forming cyanides. Combined with hydrogen it forms prussic acid.

Cyanom′eter ("measurer of blue") is the name of an instrument invented by Saussure for ascertaining the intensity of color in the sky. It consists of a circular piece of metal or pasteboard, with a band divided by radii into fifty-one portions, each of which is painted with a shade of blue, beginning with the deepest, not distinguishable from black, and decreasing gradually to the lightest, not distinguishable from white. The observer holds this up between himself and the sky, turning it gradually round till he finds the tint of the instrument exactly corresponding to the tint of the sky.

Cyan′otype Process, a photographic picture obtained by the use of a cyanide. This process is in very common use by architects and engineers for copying plans, producing an image with white lines upon a blue ground. Sensitive paper is made by brushing it over with a solution of ferric oxalate; it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate.

Cybele (sib′o-lē), originally a goddess of the Phrygians, like Isis, the symbol of the moon, latterly introduced among the Greeks and Romans. Her worship was celebrated with a violent noise of instruments and rambling through fields and woods, and her priests were eunuchs in memory of Atys.

Cycada′ceæ (or Cycads), a nat. order of gymnospermous plants, resembling palms in their general appearance, and, as a rule, increasing by a single terminal bud. The leaves are large and pinnate, and usually rolled up when in bud like a crozier. The microscopic structure of the wood, as well as the general structure of their cones, allies them with the conifers.

Cycladés (sik′la-dēz) (or kyklades), the principal group of islands in the Grecian Archipelago now belonging to the kingdom of Greece, so named from lying round the sacred island of Delos in a circle. The largest islands of the group are Andros, Paros, Myconos, Tenos, Naxos, Melos, and Thera or Santorin. They are of volcanic formation and generally mountainous. Some are very fertile, producing wine, olive oil, and silk; others almost sterile. The inhabitants are excellent sailors. Pop. 132,020.

Cycling. See *Bicycle.*

Cycloid Fishes, an order of fishes according to the arrangement of Agassiz, having smooth, round, or oval scales, as the salmon and herring. The scales are formed of concentric layers, not covered with enamel and not spinous on the margins; they are generally imbricated, but are sometimes placed side by side without overlapping.

Cyclom′eter, a machine attached to a wheel, especially to that of the bicycle, to measure and record the distance traveled. This machine is a modification of and an improvement upon the odometer, which is known to have been used in the time of the Emperor Commodus. It is spoken of by Capitolinus in his *Life of the Emperor Pertinax;* also carvings of this instrument were made on the ducal palace of Urbino in the fifteenth century. Distances were measured in France by this instrument in 1550, and descriptions of this machine appeared in 1604 and 1612. An English artist, named Butterfield, invented an odometer at the end of the seventeenth century, and various improvements were made in France and other countries during the eighteenth century. Among the oldest inventions patented in the U. S. is an odometer (or road measurer), cyclometer for use on a coach. This was invented by W. A. Turner and patented in 1833. The registering mechanism was similar to that used to-day on gas meters, and it was placed in the body of the coach and operated from the wheel through a series of shafts, wheels, and universal joints. Since that time about two hundred patents have been granted in the U. S. for odometers or cyclometers. Most of them have been similar to Turner's but placed near the wheels and operated direct. Others have been operated by electricity, which necessitated carrying a battery. With the revival of the bicycle the name was changed from odometer to cyclometer, and numerous new designs were brought out. Among the best of these was Stanton's bicycle log, an English instrument which was clamped to the axle of the front wheel and operated by a weight on the inside. The next step was to allow the cyclometer to hang loosely on the axle and operate it by the latter by means of a

worm wheel or pin. The Ritchie cyclometer was operated by a magnet which revolved with the axle and moved a small needle within the case. This allowed the case to be hermetically sealed against dust and oil and yet avoided the uncertain action due to jarring and centrifugal force of a weight. The Hoyt cyclometer, 1886, was attached to the under side of the pedal and operated by a cam attached to the crank. About 1890 shortly after the advent of the modern safety bicycle, the cyclometers were attached to the front fork and operated by a pin or projection attached to the wheel. The dials resembled a watch, the distance being designated by hands or by figures appearing through small openings on the dial. With these instruments the figures occupied only a small part of the space taken up by the dial so that the latter was larger and projected farther from the bicycle than necessary and was frequently broken. In 1895 the form was changed from a round dial to a cylinder or barrel. This form is light, compact, while the figures are large and easily read and has proved to be very popular. Accuracy is an important point in any measuring instrument, but when a soft or yielding tire is used it becomes impossible to register the distance traveled with absolute accuracy. The number of revolutions of the wheel in going a mile will be more or less as the tire is soft or hard, this being especially the case with pneumatic tires. For instance the front wheel of a standard bicycle is 28 in. in diameter, and if the tire were incompressible would revolve 720 times in going one mile. If the tire is very soft and compresses ¼ in., that is, if the diameter is equivalent to 27½ in., it will revolve 733 times per mile. Some cyclometers, for standard sized wheels, register a mile for every 728 revolutions which corresponds to a compression of about $\frac{5}{32}$ in., which seems to be a fair average. The wheel will then advance 87 in. in one revolution and may be tested as follows: Place the bicycle on a smooth floor with a rider in the saddle; mark the tire and the floor under the center of the wheel; then carefully push the bicycle ahead in a straight line until the mark on the tire again comes under the center of the wheel; mark the floor again opposite the mark on the tire. If the distance between the two marks on the floor is 87 in., the cyclometer will register correctly.

The manufacture of cyclometers requires the best material, the finest machinery, and as much care as a watch. One of the largest factories in the U. S. employs 140 people on this work exclusively. Most of these are women.

Cyclone (sī′klon), a circular or rotatory storm or system of winds, varying from 50 to 500 mi. in diameter, revolving round a center, which advances at a rate that may be as high as 40 mi. an hour, and toward which the winds tend. Cyclones of greatest violence occur within the tropics, and they revolve in opposite directions in the two hemispheres—in the southern with, and in the northern against, the hands of a watch — in consequence of which, and the progression of the center, the strength of the storm in the northern hemisphere is greater on the south of the line of progression and smaller on the north, than it would be if the center were stationary, the case being reversed in the southern hemisphere. An *anticyclone* is a storm of opposite character, the general tendency of the winds in it being away from the center, while it also shifts within comparatively small limits. Cyclones are preceded by a singular calm and a great fall of the barometer.

Cyclo′pian Works, in ancient architecture, masonry constructed with huge blocks of stone unhewn and uncemented, found in Greece, Sicily, Asia Minor, etc.

Cy′clops, in Greek myths, a fabled race of one-eyed giants, the sons of Urănus and Gē (Heaven and Earth), slain by Apollo. They were often represented as a numerous race living in Sicily and rearing cattle and sheep. Of such is the Cyclops of the Odyssey. Later traditions describe them as the servants of Vulcan working under Ætna, and engaged in forging armor and thunderbolts. *Cyclops* is likewise the generic name of a certain minute Crustacean, order Branchiopoda, having but one eye, situated in the middle of its forehead.

Cydnus (sid′nus), a river in Cilicia, rising in the Taurus Mountains, anciently celebrated for the clearness and coolness of its waters.

Cyl′inder, a geometrical solid which, in popular language, may be described as a long, round, solid body, terminating in two flat, circular surfaces which are equal and parallel. In steam engines, the cylinder is the chamber in which the force of the steam is exerted on the piston.

Cylin′drical Lens, a lens whose surfaces are cylindrical, instead of spherical, which is usually the case. A convex cylindrical lens brings the image of a source of light to a focus in a line instead of in a point. They are usually cylindrical on one side and flat on the other.

Cy′ma, in architecture, a wavy molding the profile of which is made up of a curve of contrary flexure, either concave at top and convex at bottom or the reverse.

Cyme (sīm), in botany, a mode of inflorescence in which the principal axis terminates in a flower, and a number of secondary axes rise from the primary, each of these terminating in a flower, while from these secondary axes others may arise terminating in the same way, and soon giving a flat-topped or rounded mass.

Cymri (kim′ri), a branch of the Celtic family of nations which appears to have succeeded the Gaels in the great migration of the Celts westward, and to have driven the Gaelic branch to the west (into Ireland and the Isle of Man) and to the north (into the Highlands of Scotland), while they themselves occupied the southern parts of Britain. At a later period they were themselves driven out of the Lowlands of Britain by the invasions of the Angles, Saxons, and Jutes, and compelled to take refuge in the mountainous regions of Wales, Cornwall, and the northwest of England. Wales may now be regarded as the chief seat of the Cymri.

Cynewulf (kin′e-wụlf), an Anglo-Saxon or early English poet, whose name we only know from its being given in runes in the poems attributed to him.

Cynics (sin′iks), a sect of philosophers among the ancient Greeks, founded by Antisthenes, a scholar of Socrates, at Athens, about 380 B.C. Their philosophy was a one-sided development of the Socratic teaching by Antisthenes and his followers, who looked only to the severer aspect of their master's doctrines, and valued themselves on their contempt of arts, sciences, riches, and all the social civilization of life.

Cy′nips, the gall-fly, a genus of hymenopterous insects remarkable for their extremely minute head and large, elevated thorax. The females are provided with an ovipositor by which they make holes where they deposit their eggs in different parts of plants, thus producing those excrescences which are known as galls.

Cynosceph′alæ ("dogs' heads"), a range of hills in Thessaly, memorable for two battles fought there in ancient times. The first was B.C. 364, between the Thebans and Alexander of Pheræ, and the second B.C. 197, in which the last Philip of Macedon was defeated by the Roman consul Flaminius.

Cy′press, a genus of coniferous trees. The common European cypress is a dark-colored evergreen with extremely small leaves, entirely covering the branches. It has a quadrangular, or, where the top branches diminish in length, pyramidal shape. Cypress trees, though of a somewhat somber and gloomy appearance, may be used with great effect in shrubberies and gardens. They are much valued also on account of their wood, which is hard, compact, and very durable, of a reddish color and a pleasant smell. It was used at funerals and as an emblem of mourning by the ancients. Its timber is valuable, and under water is almost imperishable. In parts of the U. S. this cypress constitutes forests hundreds of miles in extent.

Cypripe′dium (Lady's Slipper), a genus of plants of the nat. order Orchidaceæ. These species are natives of the U. S.

Cyp′ris, a genus of minute fresh-water crustaceans popularly known as water fleas. They have the body enclosed in a delicate shell and swim by means of cilia. The Cypris is common in stagnant pools, and is very often found in a fossil state.

Cy′prus, an island lying on the south of Asia Minor, and the most easterly in the Mediterranean. Its greatest length is 145 mi. maximum breadth about 60 mi.; area 3,678 sq. mi. The chief features of its surface are two mountain ranges, both stretching east and west, the one running close to the northern shore, and extending through the long north-eastern horn or prolongation of the island; the other and more massive occupying a great part of the south of the island, and rising in Troödos to 6,590 feet. Between them is the bare and mostly uncultivated plain called Messaria. There is a deficiency of water. The climate is in general healthy. The mountains are

covered with forests of excellent timber (now under government supervision), and the island is esteemed one of the richest and most fertile in the Levant. Agriculture, however, is in a very backward state, and locusts sometimes cause great damage. Wheat, barley, cotton, tobacco, olives, raisins, and carobs are the most important vegetable products. The wine is famous, especially that known as *commandery*. Silkworms are reared, and a coarse kind of silk is woven. Salt in large quantities is produced. The minerals are valuable; the copper mines were of great importance in ancient times (the name *copper* is derived from that of this island), and are again being worked. Large numbers of sheep and goats are reared on the extensive pasture lands of the island. The principal towns are Lefkosia or Nicosia, the capital, the only considerable inland town, and the seaports Larnaca and Limassol. The chief exports are carobs, wine, and cotton, with cheese, raisins, cocoons, wool, etc.

After belonging successively to the Phœnicians, Greeks, Egypt, Persia, and again to Egypt, Cyprus in 57 B.C. became a Roman province, and passed as such to the eastern division of the empire. In 1191 it was bestowed by Richard of England (who had conquered it when engaged in the third Crusade) on Guy de Lusignan, and after his line was extinct it fell into the hands of the Venetians (1489), with whom it remained till it was conquered by the Turks in 1571 and annexed to the Ottoman Empire. In 1878 it was ceded to Britain by the convention of Constantinople concluded between England and Turkey, its reversion to Turkey being provided if Russia should give up Batoum and Kars. Britain was also bound to pay a subsidy to Turkey annually amounting to about $465,000, but this is not paid directly, being retained as an offset against British claims on Turkey. The island has become much more prosperous under British administration, and roads, harbor works, etc., have been constructed, trees planted, and schools opened. The head of the government is the chief commissioner, and there is a legislative council of twelve elected and six official members, nine of the former being Greeks, the others Mohammedans. Pop. 186,000, of whom three fourths belong to the Greek Church.

Cyr (sēr), St., a French village in the department of the Seine-and-Oise, famous for the seminary for the education of ladies of rank which Louis XIV founded here. During the revolution this institution was done away with, and the buildings finally converted into a military school by Napoleon (1803). Pop. of the commune, 2,870.

Cyrenaica (si-re-nā′i-ka), once a powerful Greek state in the north of Africa (corresponding partly with the modern Barca), west of Egypt, comprising five cities (Pentapolis), among which was Cyrene, a Spartan colony, founded in 631 B.C. Latterly it came into the hands of the Ptolemies, and in B.C. 95 the Romans obtained it. The Arab invasion ruined it (647). Cyrenaica is at present a vast but as yet imperfectly explored field of antiquities.

Cyrene (si-rē′nē), in ancient times a celebrated city in Africa, about 10 mi. from the north coast, founded by Battus, and a body of Dorian colonists, B. C. 631. Numerous interesting remains have been discovered here. The town now occupying the site of the ancient Cyrene is a miserable place in the vilayet of Barca.

Cyrillian Letters, characters used in one of the modes of writing the Slavonic language. In Poland, Bohemia, and Lusatia, Roman or German letters are used; but among Russians, Bulgars, and all the Slavonic nations belonging to the Greek Church, the Cyrillic alphabet, a modification of the Greek one, is in use. Besides these there is the Glagolitic alphabet, in which the oldest literature of the Slavonic church is written.

Cy′rus, king of Persia, a celebrated conqueror. According to Herodotus he was the son of Cambyses, a distinguished Persian, and of Mandane, daughter of the Median king Astyages. His grandfather, made apprehensive by a prophecy that his grandson was to dethrone him, gave orders that Cyrus should be destroyed after his birth. But the boy was preserved by the kindness of a herdsman, and at length sent to his parents in Persia. Here Cyrus soon gathered a formidable army, conquered his grandfather (B. C. 559), and thus became king of Media and Persia. He was slain in battle with a Scythian nation in B. C. 529.

Cyrus, called the *Younger*, to distinguish him from Cyrus the founder of the Medo-Persian monarchy, was the second son of Darius Nothus or Ochus. Having formed a conspiracy against his elder brother, Artaxerxes Mnemon, Cyrus was condemned to death, but released at the request of his mother, Parysates, and made governor of Asia Minor. Here he secretly gathered an army, an important part of which consisted in 13,000 Greek auxiliaries, and marched eastward. His brother with a large army met him in the plains of Cunaxa (B.C. 401), and in the battle which followed, although the troops of Cyrus were victorious, Cyrus himself was slain.

Cystop′teris, bladder fern, a genus of polypodiaceous delicate flaccid ferns.

Cyt′isus, a genus of plants belonging to the natural order Leguminosæ, sub-order Papilionaceæ. The members of the genus are shrubs or small trees, sometimes spiny, with leaves composed of three leaflets, and with yellow, purple, or white flowers. They belong to Europe, Asia, and North Africa, and are very ornamental plants.

Cyz′icus, a peninsula of Asia Minor, 60 mi. s.w. of Constantinople. It was once an island, and the site of an ancient town of the same name.

Czar (zär or tsär), a title of the Autocrat of all the Russias, not improbably a corruption of the Roman title Cæsar. It was first adopted in 1579 by Ivan II. The feminine of czar is *czarina*, meaning the empress of Russia.

Czechs (cho*h*s), the most westerly branch of the great Slavonic family of races. The Czechs have their headquarters in Bohemia, where they arrived in the fifth century. The origin of the name is unknown. The total number of the Czechs is about 6,000,000, nearly all of whom live in the Austrian Empire. The Czechs proper, in Bohemia, number about 2,700,000. They speak a Slavonic dialect of great antiquity and of high scientific cultivation. The Czech language is distinguished as highly inflectional, with great facility for forming derivatives, frequentatives, inceptives, and diminutives of all kinds. Like the Greek it has a dual number, and its manifold declensions, tenses, and participial formations, with their subtle shades of distinction, give the language a complex grammatical structure. The alphabet consists of forty-two letters, expressing a great variety of sounds. In musical value the Czech comes next to Italian.

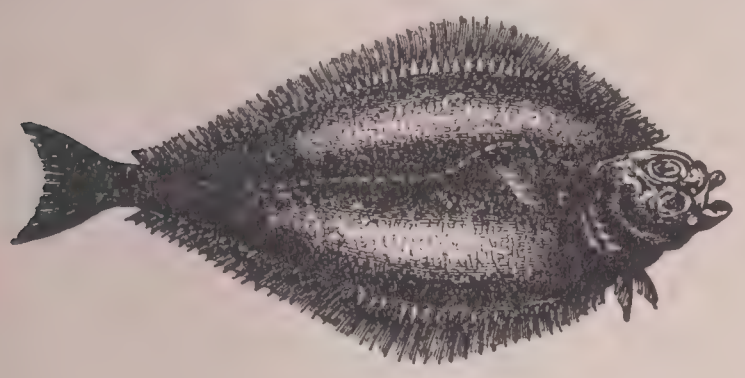
Czegled (tseg′lād), a market town, Hungary, 39 mi. s. e. of Budapest, in a district yielding grain and wine. Pop. 24,872.

Czernowitz (cher-nō′vits), a city of Austria, chief town of Bukowina, 138 mi. s. e. of Lemberg. It has manufactures of clocks, silver-plate, carriages, toys, etc. Pop. 45,600, a considerable proportion being Jews.

D

D, the fourth letter in the alphabet, representing a dental sound formed by placing the tip of the tongue against the root of the upper teeth, and then forcing up vocalized breath, or voice, into the mouth, the soft palate being raised to prevent its escape through the nose. T is formed in the same way, except that it is uttered with breath merely and not with voice. As a numeral, D represents 500.

Dab, a fish belonging to the family of flatfishes, comprising also the soles, turbots, halibuts, plaice, and flounder, the last two being included in the same genus with the dab. It is of a pale brownish color spotted with white on the side which it usually keeps uppermost, and



Dab.

white on the underside, and has rougher scales than the other members of the same genus. It is preferred to the flounder for the table.

Dacca, a district of Hindustan in Bengal, at the head of the Bay of Bengal; area, 2,797 sq. mi. It is one of the richest districts in India, and produces such quantities of rice as to be called the granary of Bengal. Dacca was at one time celebrated for its hand-woven muslins, which are still hardly to be equaled in their combination of durability and delicacy. Dacca, its capital, is about 150 mi. n.e. of Calcutta. Dacca, being free from violent heats, is one of the healthiest stations in Bengal. Pop. 82,321.

Dace, a small river fish of the family Cyprinidæ, and resembling the roach but longer and thinner. It is a gregarious fish swimming

Dace.

in shoals and inhabiting chiefly deep, clear streams with a gentle current. It seldom exceeds a pound in weight.

Da'cia, in ancient times, a region north of the Danube, inhabited by the Daci, or Getæ, afterward a Roman province. It was con-

quered by the emperor Trajan in 101 A.D., but in 274 A.D., in the reign of Aurelian, had to be abandoned by the Roman colonists.

Da'do, in classical architecture, the middle part of a pedestal, that is to say, the solid rectangular part between the plinth and the cornice; also called the *die.* In the interior of houses it is applied to a skirting of wood several feet high round the lower part of the walls, or an imitation of this by paper or painting.

Dæ'dalus, a mythical Greek sculptor, the scene of most of whose labors is placed in Crete. He is said to have lived three years before the Trojan War. He built the famous labyrinth in Crete.

Daff'odil, the popular name of a European plant which is one of the earliest ornaments of gardens, being a favorite object of cultivation.

Daghestan', a province of Russia, in the Caucasus. Area 11,332 sq. mi.; pop. 609,380. Its fertile and tolerably cultivated valleys produce good crops of grain, and also silk, cotton, flax, tobacco, etc.; capital, Derbend.

Dag'obert I (600–638), surnamed the Great, one of the Merwing kings of France. He succeeded his father, Hhlotar II, in 628; warred successfully against Gascons, Bretons, Saxons, and Slavonians; reformed the Frankish laws; d. at Epinay, and was buried at St. Denis. He was an able but a cruel and licentious king.

Da'gon (probably from the Hebrew *dag,* a fish), the god of the Philistines, whose image is generally believed to have been in the form of a triton, or merman, with the upper part human and the extremities, from the waist downward, in the shape of the tail of a fish.

Daguerre (dä-gār), Louis Jacques Mande (1789–1851), the inventor of the first photographic process. He was a scene-painter at Paris, and as early as 1814 had his attention directed by Nicéphore Niepce to the subject of photographic pictures on metal. In 1829 they made a formal agreement to work out the invention together, but it was not till after 1833, that Daguerre succeeded in perfecting the process since called *daguerreotype.* The new process excited the greatest interest. Daguerre was made an officer of the Legion of Honor, and an annuity of 6,000 francs was settled on him, and one of 4,000 on the son of Niepce.

Daguerreotype Process (da-ger'ro-tīp), the original photographic process, consisting in sensitizing a silver plate with the vapor of iodine, and then placing it in a camera obscura previously focused, and afterward developing the picture by vapor of mercury. It is then fixed by immersion in hyposulphate of sodium. After thorough washing and drying the picture is covered with glass to prevent its being rubbed off. Daguerreotype has now been superseded by the collodion and other processes.

Dahlgren, John Adolph (1809–1870), American naval officer and artillerist; he entered the navy in 1826, passed midshipman in 1832, and afterward served in the coast survey. In 1843 he went to the Mediterranean on a cruise. On his return, in 1845, he was assigned to ordnance duty in Washington. In 1857 he equipped the *Plymouth*, and visited the coast of Europe from Portugal to Holland. Subsequently he cruised in the West Indies, and on his return to Washington, resumed command of the ordnance department, of which he was made chief in July, 1862. At the beginning of the Civil War he had charge of the defenses of Washington on the left, and in 1863, he was made rear admiral, and was placed in command of the South Atlantic blockading squadron. In 1866 he had command of the South Pacific squadron, and in 1868 again took charge of the bureau of ordnance in Washington. In 1869 he was appointed commandant of the Washington navy yard. His works on ordnance have been used as text-books by the government.

Dahlgren (däl′gren) **Guns,** an improved kind of cannon invented by Admiral Dahlgren of the U. S. navy. The chief peculiarity consists in their having less metal between the muzzle and the trunnions than ordinary cannon.

Dah′lia (so called after the Swedish botanist Dahl), a genus of plants belonging to the nat. order Compositæ, sub-order Corymbiferæ,

Dahlia. A.—single; B.—double varieties.

natives of Mexico. By cultivation an immense number of varieties have been produced. The flowers are large and beautiful, sporting into innumerable varieties. It does not stand frost, and has to be taken up during winter.

Dahlmann (däl-mån), Friedrich Christoph, (1784–1860), a distinguished historian of Germany. He was professor at Göttingen and

afterward at Bonn, and distinguished himself as an advocate of liberal measures in politics.

Daho′mey, a kingdom of West Africa; area 3,960 sq. mi.; pop. 250,000. The country yields cotton, sugar, tobacco, indigo, palm-oil, ivory, india-rubber, yams, melons, oranges, limes, pineapples, and other fruits, and beans, peas, maize, millet, and Guinea-corn in abundance. A plentiful supply of cattle is to be found over all the country. Wild animals are numerous, including the lion, tiger, elephant, hyena, the boa, and other reptiles. The inhabitants are a tall, well-made, and warlike, but savage race, of pure negro blood, belonging to a branch of the Ewe family, partly employed in agriculture, and practising a rude form of fetish-worship made up of ridiculous ceremonials and extensive human sacrifices. All the females in the state belong nominally to the king, and at a grand yearly festival there is a general distribution of wives. The only considerable town is Abomey, or Agbome, the capital, situated 95 mi. inland from its small port of Whydah. It is surrounded by mud-built walls and by a ditch four miles in circumference, but only contains some 20,000 inhabitants. In October, 1885, at the request of the king, Dahomey was placed under the protectorate of Portugal. In 1890 King Benhawzin and the French fell out about Porto Novo and Kotonu, which the latter claimed. A short war resulted in the submission of the king, who agreed to waive all claim to the territory in question on the receipt of an annual payment of $4,000. Peace lasted only two years, when the French were forced to march against the king, who fled. In 1894 he surrendered, and was sent to Senegal with the chiefs who had sided with him. The French annexed the districts of Whydah, Savi, Godomey, Abomey-Kalavy, and Avrekete, and proclaimed the rest of the country a French protectorate. Later on, in 1894, Guthili was elected king, and in January, 1895, obtained French recognition.

Dairy, the department of a farm which is concerned with the production of milk and its manufacture into butter and cheese. As a rule the soil and climate of a country, and the nearness of suitable markets, determine in a great measure the choice between tillage and dairy husbandry. For milk dairies, cows that yield abundantly are selected, while for butter and cheese dairies the rich quality of the milk is the principal point. In the U. S. the cattle of Ayrshire and Jersey hold the first place for dairy purposes; the first on account of the large yield which they give on comparatively poor feeding, the second for the richness of their milk.

Daisy, the name of a plant which is very familiar, and a great favorite. It never ceases to flower, and is nearly naturalized in New England. In the days of chivalry it was the emblem of fidelity in love. Its name is literally, day's eye, because it opens and closes its flower with the daylight.

Dalber′gia, a genus of fine tropical forest trees and climbing shrubs, some species of

which yield excellent timber. The blackwood, or East India rosewood, is a magnificent tree, furnishing one of the most valuable furniture woods.

Dalecar′lia (or Dalarne), a tract in Sweden. The name, meaning "valley-land," is kept alive in the minds of the inhabitants by the noble struggles which the Dalecarlians, its inhabitants, made to establish and maintain the independence of the country.

Dalhousie, James Andrew Brown Ramsey, tenth Earl and first Marquis of (1812–1860), British statesman. After filling the offices of vice-president (1843) and president of the board of trade (1844), he was appointed governor general of India (1847). He greatly extended the British Empire in India, annexing the Punjab, Oude, Berar, and other native states, as well as Pegu, in Burmah.

Dallas, Dallas co., Tex., on Trinity River. Surrounding country agricultural. Railroads: Houston & Texas Central; Gulf, Colorado & Santa Fé; Trunk; Texas Pacific; M. K. & T.; Midland. Industries: saddles, harness, and collars, cotton gins, cotton mill, flouring mills, four iron foundries, paper mills, galvanized iron and copper cornices, traveling goods, candy and cigar factories, shirt, hat, and tinware manufactures. The town was first settled in 1840 and became a city in 1856. Pop. 1900, 42,638.

Dallas, George Mifflin (1792–1864), statesman, b. in Philadelphia. He graduated at Princeton, in 1810. He went to Russia as private secretary to Albert Gallatin, one of the commissioners to negotiate a treaty with Great Britain through the Russian emperor. In 1817 he was made deputy attorney general of Philadelphia, of which he was elected mayor in 1828. This office he resigned to become U. S. district attorney. In 1831 he was sent to the U. S. Senate. In 1837–39 he was minister to Russia, and on his return practised law in Philadelphia. In 1844 he was elected vice-president by the Democratic party. In 1856 he was made minister to England. He returned to Philadelphia in 1861.

Dalles (dalz), the name given to various rapids and cataracts in the U. S. *The Great Dalles of the Columbia* are about 200 mi. from its mouth, where the river is compressed by lofty basaltic rocks into a roaring torrent about 58 yds. in width; the *Dalles of the St. Louis* are a series of cataracts, near Duluth, Minn.

Dalma′tia, a province of Austria, with the title of kingdom, the most southern portion of the Austrian dominions. Area 4,940 sq. mi; pop. 527,426. The inland parts of Dalmatia are diversified by undulatory ground, hills, and high mountains; there are some rich valleys, but the country is considered unproductive. The interior is occupied by a neglected population, and agriculture is in a backward state. Apples, pears, peaches, apricots, oranges, pomegranates, etc. are among the fruits; the wines are strong, sweet, and full-bodied. On the coast, fish, especially the tunny and the sardine, abound. The trade of the country is mostly confined to the coast towns, where the population is

mainly of Italian extraction. Chief of these are Zara (the capital), Sebenico, Cattaro, Spalato, and Ragusa. Among the numerous islands sprinkled along the coast many are valuable for their productions, such as timber, wine, oil, cheese, honey, salt, and asphalt. After passing successively through the hands of Hungarian and Venetian rulers, and of the first Napoleon, Dalmatia finally, in 1814, fell under Austrian rule.

Dalmat′ic (or dalmatica), an ecclesiastical vestment worn by the deacon at mass, so called because it was an imitation of Dalmatian costume. It is worn also by bishops under the chasuble. It is a long robe with large full sleeves with black or red longitudinal stripes and partially unclosed sides.

Dalrymple, John (1648–1707), first earl of Stair, an able Scottish lawyer and statesman. It was through him that the massacre of Glencoe was perpetrated in 1692.

Dalton, John (1766-1844), an English chemist and natural philosopher. In 1808 he announced his atomic theory of chemical action, the discovery of which spread his fame over Europe.

Daly, Augustin, playwright, b. in Plymouth, N. C., July 20, 1838; acted as dramatic editor of New York newspapers, and in 1869 began his career as a theatrical manager. He produced adaptations from French and German authors and a few original plays. Died 1899.

Dam, a bank, or construction of stone, earth, or wood across a stream for the purpose of keeping back the current to give it increased head, for holding back supplies of water, for flooding lands, or for rendering the stream above the dam navigable by increased depth. Its material and construction will depend on its situation and the amount of pressure it has to bear. For streams which are broad and deep strong materials are required, usually stone masonry bound in hydraulic cement and a strong framework of timber. The common forms of a dam are either a straight line crossing the stream transversely, or one or two straight lines traversing it diagonally, or an arc with its convex side toward the current.

Dam′ages, in law, pecuniary compensation paid to a person for loss or injury sustained by him through the fault of another. It is not necessary that the act should have been a fraudulent one; it is enough that it be illegal, unwarrantable, or malicious. If, however, a person has suffered a loss through fraud or delict on the part of another, that person has not only a claim to ordinary damages, but may also claim remote or consequential damages, and may estimate the amount of the loss he has sustained not at its real value, but at the imaginary value which he himself may put upon it, subject, however, to the modification of a judge or a jury. In other cases the damages cover only the loss sustained estimated at its real value, together with the expenses incurred in obtaining damages.

Daman (d*a*-män′), a seaport, Hindustan, 100 mi. n. from Bombay. It belongs to the Portuguese, who conquered it in 1531, and made it

a permanent settlement in 1558. The settlement, which is governed under Goa, has an area of 82 sq. mi.; pop. 49,084.

Dam'araland, a German protectorate in South Africa, extending along the Atlantic coast from Cape Frio to Walfisch Bay, and inland to 20° e. long. Area about 100,000 sq. mi., including a large amount of barren lands.

Damas'cus, a celebrated city, capital of the Turkish vilayet of Syria, supposed to be the most ancient city in the world. It is beautifully situated on a plain which is covered with gardens and orchards and watered by the Barrada. The appearance of the city, as it first opens on the view, has been rapturously spoken of by all travelers; but the streets are narrow, crooked, and in parts dilapidated, and, except in the wealthy Moslem quarter, the houses are low, with flat arched doors and accumulations of filth before the entrance. Within, however, there is often a singular contrast, in courts paved with marble and ornamented with trees and spouting fountains, the rooms adorned with arabesques and filled with splendid furniture. Among the chief buildings are the Great Mosque and the Citadel. The bazaars are a notable feature of Damascus. They are simply streets or lanes covered in with high wood work and lined with shops, stalls, cafés, etc. In the midst of the bazaars stands the Great Khan, it and thirty inferior khans being used as exchanges or market-places by the merchants. One of the most important and busiest streets is "Straight Street," mentioned in connection with the conversion of the apostle Paul. Damascus is an important emporium of trade in European manufactures; it is also a place of considerable manufacturing industry in silk, damasks, cotton, and other fabrics, tobacco, glass, soap, etc. Saddles, fine cabinet work, and elegant jewelry are well made; but the manufacture of the famous Damascus blades no longer exists. It is one of the holy Moslem cities, and continues to be the most thoroughly Oriental in all its features of any city in existence. Of its origin nothing certain is known; but it is of great antiquity, being mentioned as a place apparently of importance in Gen. 14:15. After passing successively under the power of Israelites, Persians, Greeks, and Romans, it fell at last in 1516 into the hands of the Turks. Pop. 198,600.

Damascus-steel, a kind of steel originally made in Damascus and the East, greatly valued in the making of swords for its hardness of edge and flexibility. It is a laminated metal of pure iron and steel of peculiar quality, carbon being present in excess of ordinary proportions, produced by careful heating, laborious forging, doubling, and twisting.

Dam'ask, the name given to textile fabrics of various materials, ornamented with raised figures of flowers, landscapes, and other forms, being the richest species of ornamental weaving, tapestry excepted. Damask is very commonly made in linen for table napery.

Damaskeen'ing, the ornamenting of iron and steel with designs produced by inlaying or incrusting with another metal, as gold, silver, etc., by etching and the like.

Damien, Father Joseph de Veuster (1840–1889), Roman Catholic missionary, b. at Tremeloo, Belgium, d. on Molokai Island, Hawaiian group. He entered holy orders at the age of nineteen, and devoted his life to the cause of the church. Having been sent on a mission to Honolulu he learned of the terrible condition of the lepers banished to Molokai Island, and decided to devote his life to the amelioration of their condition. He went to live among them in 1873, combining in his own person the offices of physician, teacher, carpenter, magistrate, and friend. In 1885 he contracted the fatal contagion, but continued his work until his death.

Damiet'ta, a town of Egypt, on one of the principal branches of the Nile, about 6 mi. from its mouth. It contains some fine mosques, bazaars, and marble baths. Alexandria has long diverted the great stream of commerce from Damietta, but the latter has still a considerable trade with the interior in fish and rice. Pop. 34,046.

Dammar Resin, a gum or resin of several kinds produced by different trees. The East Indian or cat's eye resin is got from a tree of the East Indian islands, and is used for making varnishes for coach builders, painters, etc.

Branch of Dammar Pine.

In its native localities it is burned as incense, also used for caulking ships. *Sal* dammar is produced by the sal tree of India, *rock* dammar by *Hopea odorata* and other species of trees; both yield good varnishes.

Damon and Pythias, two illustrious Syracusans, celebrated as models of constant friendship. Pythias had been unjustly condemned to death by Dionysius the younger, tyrant of Sicily; but, having to leave Syracuse to arrange his affairs, his friend Damon was taken as a pledge that Pythias should return on the day fixed. Pythias, however, being unexpectedly detained, had great difficulty in reaching Syracuse in time to save Damon

being executed in his place; and Dionysius was so affected by this proof of their friendship that he pardoned Pythias. The Knights of Pythias, a fraternal order established in the U. S., has this pleasant incident for its basis. Its growth has been remarkably rapid, and lodges are in existence in every state of the Union.

Damps, noxious exhalations issuing from the earth, and deleterious or fatal to animal life. Damps exist in wells which continue long covered and not used, and in mines and coal-pits; and sometimes they issue from the old lavas of volcanoes. These damps are distinguished by miners under the names of *choke-damp*, consisting chiefly of carbonic acid gas, which instantly suffocates; and *fire-damp*, consisting chiefly of light carbureted hydrogen, so called from its tendency to explode.

Dam'son, a variety of the common plum. The fruit is rather small and oval, and its numerous sub-varieties are of different colors: black, bluish, dark purple, yellow, etc. The damson, as its name imports, is from Damascus.

Dan (Hebrew meaning "judgment"), one of the sons of Jacob by his concubine Bilhah. At the time of the exodus the Danites numbered 62,700 adult males, being then the second tribe in point of numbers. Samson was a member of this tribe.

Dana, CHARLES ANDERSON, editor, was b. in Hinsdale N. H., Aug. 8, 1819. After association with the N. Y. *Tribune* for fourteen years as one of the proprietors and managing editor, in 1863 was appointed assistant secretary of war. In 1868 Mr. Dana became editor of the N. Y. *Sun*. Perhaps more than any other journalist his personality was identified with his newspaper. He d. in 1897.

Da'na, JAMES DWIGHT, naturalist, b. 1813, and since 1855 a professor at Yale College. He has written *System of Mineralogy; Manual of Mineralogy; Coral Reefs and Islands; Manual of Geology; Text-book of Geology;* and many reports and papers. He d. in 1895.

Dana, RICHARD HENRY (1787–1879), writer, b. at Cambridge, Mass.; educated at Harvard; published several collections of poems and two novels. His son Richard Henry (1815–1882), was the author of the well-known work, *Two Years Before the Mast*, the result of his own experiences during a voyage recommended to him on account of his health.

Dan'ae, in Greek mythology, daughter of Acrisius, king of Argos. She was shut up by her father in a brazen tower, but Zeus, inflamed with passion for her, transformed himself into a golden shower, and descended through the apertures of the roof into her embraces. Set adrift on the waves by her father, she reached safely one of the Cyclades, where her child, Perseus, was brought up.

Dan'bury, a town of Fairfield co., Conn., situated on the Still River, a tributary of the Housatonic, about 53 mi. n. n. e. of New York, with which it is connected by rail. There is a monument, erected in 1854, to the memory of General Wooster, who was mortally wounded in 1777, when the town was burned by the English under General Tryon, and another, of more recent date, to commemorate the other citizens who perished on the same occasion. The principal industry is the manufacture of hats, which was introduced in 1780, and is carried on by ten separate companies; shirts are also largely produced, and sewing machines are constructed. Pop. 1900, 16,537.

Dancing, a form of exercise or amusement in which one or more persons make a series of more or less graceful movements with measured steps in accord with music. In its earliest forms among simple races, it is a mode of outward expression for strong emotions of joy and sorrow, love and rage, and even for the most solemn and impassioned religious feelings; in more civilized strata of human society it becomes a mere frivolous amusement with no high signification whatever. Dancing corresponds to a universal primitive instinct in man. It is still practised by the South Sea Islanders, the forest Indians of Brazil, the Zulus, the negroes of Central Africa, and the native Australians, exactly as it was in the earlier stages of every civilized modern race. Many of the rude courting dances of modern savages, like the native Australian *corro-boree*, are themselves refinements of more ancient dances, in the survivals of which we can guess at their original grossness and obscenity. Ferocious war-dances were constantly practised by savage warriors, as the North American Indian braves, who worked themselves up into frantic mechanical intoxication capable of carrying them irresistibly on to victory. The Zulu war dance is still a noble exercise for warriors, like the Pyrrhic dance of the ancient Spartans; and the dancing and spinning dervishes in the East, who work themselves into spasms of physical excitement, are still highly esteemed for devoutness and piety. Into savage dancing, moreover, the idea of magic always enters. Thus the Mandan Indians dance Buffalo to bring game when supplies of food are low, the rain doctors of central Africa dance mystic dances to bring down rain, and the wives of Gold Coast negroes dance a battle dance to give their absent husbands courage in the battle. Everywhere in ancient religions is dancing one of the chief acts of worship. In ancient times it was generally an expression of religious, patriotic, or military feeling, as in the case of the dance of David before the ark, the choric dances, or the Pyrrhic dance of the Greeks. The Romans, however, like the Orientals, had their dancing done by hired slaves. This solemn character of the dance has declined with the progress of refinement and civilization, and it is now nothing more than an elegant social amusement and an agreeable spectacle at public entertainments. France took the lead in inventing modern dances. Among some of the early dances which were paramount in France were the graceful *minuet*, the favorite for a century; the *quadrille;* the *Ecossaise*, first introduced in 1760; the *galop*, a death blow to the "poetry of motion," introduced from Germany; the *cotil-*

lon, fashionable under Charles X; the *polka*, first danced at Odéon in 1840 by a dancing-master from Prague; the *polka tremblante*, or *schottisch*, also of Bohemian origin, first brought out in Paris in 1844; the *lancers*, introduced by Laborde in 1836; and the *waltz*, originally Bavarian, and which, now considerably modified from its original form, promises to maintain its supremacy. The French provide the world with fashions, and society everywhere has followed their lead. Characteristic of particular races or merely of classes of people are such forms of the dance as the Scotch *reel*, *Highland fling* and *strathspey*, the Irish *jig*, the negro *break-downs*, sailors' *horn-pipes*, *step-dances*, the *can-can*, *morris-dances*, and the like.

Dandeli'on, a plant indigenous to Europe, but now also common in this country. The leaves are all radical, and runcinate, or jagged on the margin. The stems are hollow and have one large, bright-yellow flower and a tapering, milky, perennial root, which acts as an aperient and tonic. The whole plant is full of a milky and bitter juice. The seed of the plant is furnished with a white pappus, and is transported far and wide by the wind.

Dandie Dinmondt Terrier, a peculiar breed of the Scotch terrier, so called from the border farmer of that name who figures in Scott's novel, *Guy Mannering*. This breed is known by its short legs, wiry and abundant hair, and large ears. It is very courageous when fully grown. It is usually either of a light-brown or a bluish-gray color, termed respectively the "mustard" and the "pepper" variety.

Danenhower, JOHN WILSON (1849–1887), American Arctic explorer, graduated at the U. S. naval academy in 1870, and in 1879 sailed from San Francisco as second in command of the *Jeannette* under Lieut. George W. DeLong. The steamer was lost in the ice, but the explorers escaped, and returned home in 1882.

Dan'iel, the prophet, a contemporary of Ezekiel, was b. of a distinguished Hebrew family. In his youth, B. C. 605, he was carried captive to Babylon, and educated in the Babylonish court for the service of King Nebuchadnezzar. Thrown into the lions' den for conscientiously refusing to obey the king he was miraculously preserved, and finally made prime minister in the court of the Persian king, Darius.

Dan'iell, JOHN FREDERICK (1790–1845), English physicist. In 1820 he published an account of a new hygrometer which he had invented. Soon afterward his valuable works, *Meteorological Essays* and the essay on *Artificial Climate*, appeared. In 1831 he was appointed professor of chemistry in King's College, London, and made further important discoveries, chief among which is his apparatus for maintaining a powerful and continuous current of electricity in galvanic batteries.

Daniell's Battery, a galvanic battery the cells of which were originally constructed in the following way: A tall, cylindrical copper vessel was nearly filled with saturated solution of sulphate of copper. A rod of amalgamated zinc was enclosed in a skin or bladder, which was filled with dilute sulphuric acid, and was suspended in the copper cylinder. When the zinc rod was connected by a wire with the copper vessel, which itself forms one of the plates of the battery, the current passes, according to common phraseology, from the copper through the wire to the zinc. Instead of the bladder or skin, porous earthenware pots are now employed to contain the dilute sulphuric acid in which the zinc is immersed. In improved modifications of Daniell's battery the most important change is that of substituting for the dilute sulphuric acid that surrounds the zinc, solution of sulphate of zinc, and in this case the zinc is not amalgamated. By doing away with the sulphuric acid local waste of the zinc is to a great extent prevented, and the solution of sulphate of zinc is used instead of pure water on account of the very high resistance of water impregnated with salts.

Dannemo'ra, a village on a lake of the same name, 24 mi. n.n.e. of Upsala, in Sweden, celebrated for its iron mines, the second richest in Sweden, which have been worked uninterruptedly for upward of three centuries, and produce the finest iron in the world.

Dante (a contraction of *Durante*), ALIGHIERI (dän'tā å-lē-gē-ā'rē) (1265–1321), the great Italian poet, was b. in Florence of a family belonging to the lower nobility. His education was confided to the learned Brunetto Latini. He seems to have been quite a boy, no more than nine years of age, when he first saw Beatrice Portinari, and the love she awakened in him he has described in that record of his early years, the *Vita Nuova*, as well as in his later great work, the *Divina Commedia*. Dante married Gemma dei Donati in 1828, by whom he had seven children. At this time the Guelfic party in Florence became divided into the rival factions of Bianchi and Neri (Whites and Blacks), the latter being an extreme papal party, while the former leaned to reconciliation with the Ghibellines. Dante's sympathies were with the Bianchi, and being a prior of the trades and a leading citizen in Florence he went on an embassy to Rome to influence the pope on behalf of the Bianchi. In Dante's absence his enemies obtained a decree of banishment against him. The poet remained an exile to the end of his life; and his history, first lost by the indifference of contemporaries and then hallowed by the legends of later generations, becomes semimythical. During this period he is said to have visited many cities, Arezzo, Bologna, Sienna, etc., and even Paris. In 1320 we find him staying at Ravenna with his friend Guido da Polenta. He was buried at Ravenna, where his bones still lie. His great poem, the *Divina Commedia* (*Divine Comedy*), written in great part, if not altogether, during his exile, is divided into three parts, entitled *Hell*, *Purgatory*, and *Paradise*. The poet dreams that he has wandered into a dusky forest, when the shade of Vergil appears and offers to conduct him through hell and purgatory. Further the pagan poet may not go, but Beatrice herself shall lead him through

paradise. The journey through hell is first described, and the imaginative power with which the distorted characters of the guilty and the punishments laid upon them, are brought before us; the impressive pathos of these short histories—often compressed in Dante's severe style into a couple of lines—of Pope and Ghibelline, Italian lord and lady; the passionate depth of characterization, the subtle insight and intense faith, make up a whole which for significance and completeness has, perhaps, no rival in the work of any one man. From hell the poet, still in the company of Vergil, ascends to purgatory, where the scenes are still mostly of the same kind though the punishments are only temporary. In the earthly paradise Dante beholds Beatrice in a scene of surpassing magnificence, ascends with her into the celestial paradise, and after roaming over seven spheres reaches the eighth, where he beholds "the glorious company, which surrounds the triumphant Redeemer." In the ninth Dante feels himself in presence of the divine essence, and sees the souls of the blessed on thrones in a circle of infinite magnitude. The Deity himself, in the tenth, he cannot see for excess of light. There are many notable translations of Dante's great poem in many languages.

Danton (dän-tōn), GEORGE JACQUES (1759–1794), one of the figures in the French Revolution. He was foremost in organizing and conducting the attack on the Tuileries, Aug. 10, 1792. He voted for the capital punishment of all returning aristocrats, and along with Robespierre brought Hébert and the worshipers of the goddess Reason to the scaffold. Robespierre succeeded in having Danton denounced and thrown into prison, 1794. Afterward he was condemned by the revolutionary tribunal as an accomplice in a conspiracy for the restoration of monarchy, and executed.

Dantzig (or Danzig) (dänt′zi*h*), a fortified town and port, Prussia, capital of the province of West Prussia, 253 mi. n.e. Berlin, on the Vistula, about 3 mi. above its mouth. It is one of the most important seaports in the Prussian monarchy. Among the principal buildings are the Dom or Cathedral, begun in 1343, the church of St. Catherine, the exchange, the arsenal, observatory, three monasteries, two synagogues, two theaters, etc. The industries are, shipbuilding, artillery, and beer. The prosperity of the town is founded chiefly on its transit trade, particularly in wheat from Poland. There is also a considerable trade in amber. The proper port of Dantzig is Neufahrwasser, at the mouth of the Vistula. After being alternately possessed by the Teutonic knights and the Poles, Dantzig, on the partition of Poland, fell to the lot of Prussia. Pop. 120,338.

Dan′ube, a celebrated river of Europe, originates in two small streams rising in the Schwarzwald, or Black Forest, in Baden, and uniting at Donaueschingen. The direct distance from source to mouth of the Danube is about 1,000 mi., and its total length, including windings, about 1,670 mi. From its source the Danube flows in a northeasterly direction to Ulm, in Würtenberg, where it becomes navigable for vessels of 100 tons; then to Ratisbon in Bavaria, where it becomes navigable for steamers. Here it turns in a southeasterly direction, entering Austria at Passau, passing Vienna and Budapest, above which latter town it suddenly turns due south, holding this direction till it is joined by the Drave, after which it runs s.s.e. and enters Servia at Belgrade. Continuing its general course eastward it forms for a long distance the boundary line between Roumania and Bulgaria. At Silistria it once more turns northward, and flowing between Roumania and Bessarabia falls into the Black Sea by three different outlets. The Danube may be estimated as admitting of about 2,500 mi. of steam navigation.

Dan′vers, a town in the county of Essex, in Massachusetts, 15 mi. n.n.e. of Boston, with which it is connected by rail. The principal industry is the manufacture of boots and shoes. The most interesting building is the Peabody Institute, with its library and art collections, founded in 1852 by George Peabody, the philanthropist, who was b. at Danvers in 1795. Pop. 7,446.

Danville, a city of Illinois, the county seat of Vermilion co., 125 mi. s. of Chicago. Situated in a rich and populous district, in the vicinity of an extensive coal-field, and well supplied with building materials and water, it forms a manufacturing center with foundries, wagon works, locomotive works, and various other industrial establishments. The railroad communications are extensive, there being seven branches of road centering here under the control of three main systems. Pop. 1900, 16,354.

Danville, the county seat of Boyle co., Ky. It is an educational center of some note, being the seat of two colleges. A deaf and dumb asylum is also located here. The principal industry of the surrounding country is agriculture. Pop. 1900, 4,285.

Danville, Pittsylvania co., Va., on Dan River, 140 mi. s.w. of Richmond. Railroads: Southern Ry., Danville & Western, and Atlantic & Danville. Industries: six cotton mills, flour mill, two iron foundries, knitting mills, twelve tobacco factories. Surrounding country agricultural and mineral. Danville was base of supplies for confederacy in 1861–65. The town was first settled in 1798. Under Virginia law every town is a city when it reaches 5,000 inhabitants. In 1896 Neapolis on n. side of river was annexed. Pop. 1900, 16,520.

Danville, Montour co., Pa., on n. branch of Susquehanna River, 154 mi. n.w. of Philadelphia. Railroads: Pennsylvania branch of S. H. & W., P. & R., and D. L. & W. Industries: steel and iron, flour mill, four iron foundries, silk mill, suspender, overall, and stocking factories. Surrounding country agricultural and mineral. The town was first settled in 1774. Pop. 1900, 8,042.

Daph′nia, the water flea, a genus of minute crustaceans belonging to the division Branch-

iopoda. The best-known species is the "branch horned" water flea, which is a favorite microscopic object. The head is prolonged into a snout, and is provided with a single, central, compound eye; it is also furnished with antennæ, which act as oars, propelling it through the water by a series of short springs or jerks. These animals are very abundant in many ponds and ditches; and as they assume a red color in summer impart the appearance of blood to the water.

Dar′danelles (-nelz; anc. *Hellespont*), a narrow channel which connects the Sea of Marmora with the Grecian Archipelago, and at this particular point separates Europe from Asia. It is about 40 mi. in length, and varies in breadth from 1 to 4 mi. A rapid current often much increased by winds runs southward. On the Asiatic side the country is fine and fertile, rising gradually upward from the sea to the range of Mount Ida; the European side is steep and rugged, but densely peopled and highly cultivated. On both shores there are numerous forts and batteries. Two castles on the opposite shores occupy the sites of ancient Sestos and Abydos, and recall the story of Hero and Leander. By treaty made in 1841 between the five great powers and Turkey, confirmed by the Peace of Paris in 1856, it is settled that no foreign man-of-war shall pass the strait without the express permission of the Turkish government.

Dare, Virginia, first English child b. in new world, b. at Roanoke, 1587. She was a granddaughter of Gov. John White.

Darfur′ (or Darfoor′), a considerable region of Central Africa, forming a large oasis in the s.e. corner of the Great Desert. Area 198,000 sq. mi.; pop. 1,420,000. The inhabitants are Mohammedans and negroes, and semi-barbarous. Their occupation is chiefly agriculture, and cattle form their principal wealth. It exports slaves, ivory, ostrich feathers, gum, copper, etc., and receives in exchange sugar, cotton cloth, hardware, firearms, etc.

Da′rien, Gulf of, a gulf of the Caribbean Sea, at the n. extremity of South America, between the Isthmus of Panama and the mainland.

Darien, Isthmus of, often used as synonymous with the Isthmus of Panama, but more strictly applied to the neck of land between the Gulf of Darien and the Pacific.

Darien Scheme, a celebrated financial project, conceived and set afloat by William Paterson, a Scotsman, toward the close of the seventeenth century. Paterson was a man of bold conceptions, and possessed of a wide knowledge of commerce and finance. He was the first projector of the Bank of England, but was disappointed of his just recompense. His next scheme was one of magnificent proportions. He proposed to form an emporium on each side of the Isthmus of Darien or Panama for the trade of the opposite continents. The settlement thus formed would become the entrepôt for an immense exchange between the manufactures of Europe and the produce of South America and Asia. Scotland subscribed

$2,000,000, a full half of all the cash in the kingdom. Little more than the half, however, was paid up. In 1698 five large vessels laden with stores, etc., and with 1,200 intending colonists, sailed for the Isthmus of Darien. The settlement was formed in a suitable position, and the colonists fortified a secure and capacious harbor; but nothing else had been rightly calculated, and at the end of eight months the survivors were compelled by disease and famine to abandon their settlement and return to Europe. Two of the ships were lost on the way home, and only about thirty, including Paterson, reached Scotland.

Dari′us, the name of several Persian kings. 1, Darius I, fourth king of Persia, son of Hystaspes, a prince of the royal family of the Achæmenidæ, attained the throne in B. C. 521. He reduced, after a two years' siege, the revolted city of Babylon, and led an expedition of 700,000 men against the Scythians on the Danube. He sent an army under Mardonius to invade Greece. But the ships of Mardonius were destroyed by a storm in doubling Mount Athos (492 B C.), and his army was cut to pieces by the Thracians. Darius, however, fitted out a second expedition of 500,000 men, which was met on the plains of Marathon by an Athenian army 10,000 strong, under Miltiades, and completely defeated (490 B.C.). Darius had determined on a third expedition when he d. B.C. 485. 2, Darius II, surnamed *Nothos*, or the Bastard, by the Greeks, an illegitimate son of Artaxerxes I. He ascended the throne in 423, and d. in 404. His son Cyrus is familiar to us through Xenophon's *Anabasis*. 3, Darius III, surnamed *Codomannus*, great grandson of Darius II, was the twelfth and last king of Persia. He ascended the throne B.C. 336, when the kingdom had been weakened by luxury and the tyranny of the satraps under his predecessors, and could not resist the attacks of Alexander of Macedon; and the army which was sent against him by Darius was totally routed on the banks of the Granicus, in Asia Minor. Darius then hastened with 400,000 soldiers to meet Alexander in the mountainous region of Cilicia, and was a second time totally defeated near the Issus, B.C. 333. Two years afterward, all proposals for peace having been rejected by Alexander, Darius collected a second army, and meeting the Macedonian forces between Arbela and Gaugamela was again routed (331 B.C.). Alexander captured Susa the capital, and Persepolis, and reduced all Persia. Meanwhile Darius was collecting another army at Ecbatana in Media, when a traitorous conspiracy was formed against him by which he lost his life in 330 B.C. Alexander married his daughter Statira.

Darjeel′ing (or Darjiling), a district of India, in the extreme north of the lieutenant-governorship of Bengal, division of Cooch-Behar. Area 1,164 sq. mi.; pop. 223,114. Tea, coffee, cinchona, and cotton are cultivated more or less, and the cultivation of the tea-plant and the making of tea is now the staple industry. Darjeeling, the chief town in the

district, is a sanatory station for the British troops.

Dar'laston, a town of England, county of Stafford. It has extensive coal and iron mines. Pop. 14,422.

Darley, Felix Octavius Carr (1822–1888), artist, b. in Philadelphia. While a clerk in a mercantile house in Philadelphia, he produced some humorous sketches, which were so highly praised that he devoted himself to the pursuit of art by making drawings for engravers. In 1848 he went to New York City. His illustrations for books became innumerable. Some of his sketches were reduced, to appear on government bonds and bank-notes.

Darling (from a governor of New South Wales), a name of several applications in Australia. The *Darling River*, a river rising in the n.e. of New South Wales, flows in a southwesterly direction till it joins the Murray. *Darling District* is a pastoral district, about 50,000 sq. mi. in extent, in the s.w. of New South Wales, and watered by the Darling and the Murray. The *Darling Downs* are a rich table-land west of Brisbane in Queensland. It is well watered, and measures about 6,000 sq. mi. The *Darling Range* is a range of granite mountains in Western Australia, running in a northerly direction parallel with the coast from Point D'Entrecasteaux for 250 mi.

Darling, Grace (1815–1842),a celebrated English heroine; b. in the Longstone Lighthouse, of which her father was keeper. In 1838 the steamer *Forfarshire*, with forty-one passengers on board besides her crew, became disabled off the Farne Islands during a storm, and was thrown on a rock where she broke in two, part of the crew and passengers being left clinging to the wreck. Next morning William Darling descried them from Longstone, about a mile distant, but he shrank from attempting to reach the wreck through a boiling sea in a boat. His daughter Grace, however, implored him to make the attempt and let her accompany him. At last he consented, and father and daughter each taking an oar, they reached the wreck and succeeded in rescuing nine sufferers. The news of the heroic deed soon spread, and the brave girl received testimonials from all quarters. A purse of $3,500 was publicly subscribed and presented to her. Four years afterward she died of consumption.

Dar'lington, a municipal borough of England, county and 17½ mi. s. of Durham, well built, chiefly of brick. The woolen manufacture is carried on to a considerable extent, and there are large iron works, and works manufacturing steel, locomotive engines, iron bridges, etc. Pop. 38,000.

Darmstadt (dårm'ståt), a town in Germany, capital of the grand-duchy of Hesse, 15 mi. s. Frankfort. Among the remarkable buildings are the old palace, the Catholic church, and the Rathhaus or townhall built in 1580. Darmstadt has some iron foundries, breweries, etc., but depends more upon the residence of the court than upon either trade or manufactures. Pop. 56,399.

Dar'nel, the popular name of a species of poisonous grass. It appears to be the tares of Scripture. Its properties are said to be narcotic and stupefying, but recent researches have cast some doubt on its reported deleterious qualities. It is met with in corn fields, and is now naturalized in North America.

Darn'ley, Henry Stuart, Lord (1541–1567), son of the Earl of Lennox and Lady Margaret Douglas, a niece of Henry VIII, and by her first marriage queen of James IV. In 1565 he was married to Mary Queen of Scots. It was an unfortunate match. Mary affected, however, to be reconciled to him, but could not long conceal her contempt for the handsome imbecile. After the birth of a son, subsequently James VI, Darnley was seized at Glasgow with smallpox, from which he had barely recovered when Mary visited him, and had him conveyed to an isolated house called Kirk of Field, close to the Edinburgh city walls. This dwelling, which belonged to a retainer of Bothwell's, the rapidly rising favorite, was blown into the air with gunpowder. The dead bodies of the king and his page were found in a field at a distance of 80 yards from the house.

Darrah, Mrs. Lydia, heroine. She was a Quaker and resided in Philadelphia. When the British Army was there the adjutant general hired one of her rooms for private conferences. On Dec. 2, 1777, some particular and emphatic directions were given that excited her curiosity. She listened at the door of the meeting room, and heard an order read that the British soldiery should march out of camp on December 4 to attack the Americans then quartered 8 mi. distant. On the following morning she walked several miles on the snowy ground, and approached the American camp. Here she met Colonel Craig, and gave him the information. When the British movement was made, they found the army of Washington prepared to meet them at all points, and the enterprise miscarried.

Darters (or Snake Birds), a genus of web-footed birds of the pelican tribe, found near the eastern coasts of the tropical parts of

Darter.

America, and on the western coast of tropical Africa, as well as in Australia. The birds perch on trees by the sides of lakes, lagoons, and rivers, and after hovering over the water suddenly dart at their finny prey with unerring aim. From the serpent-like form of their head and neck, the head being scarcely thicker than the neck, they are called snake birds.

Dart′ford, a town, England, Kent, 15 mi. s.e. of London. On the river are numerous paper, corn, and oil mills, a large foundry, and an extensive gunpowder manufactory, etc. Dartford was the first place in Britain where a paper mill was erected. Wat Tyler was a native of this place, and the insurrection known by his name broke out at Dartford (1377). Pop. 11,962.

Dartmoor′, an extensive upland tract in England, in the western part of Devonshire, and belonging to the duchy of Cornwall; area 150,000 acres. Cattle and sheep are fed on the coarse grass during the summer months. Several of the rugged granite hills are of considerable height. Dartmoor prison, built in 1809 as a state-prison, is now a convict depôt.

Dartmouth College, Hanover, N. H., is the outgrowth of an Indian school which was opened in 1754. A few years later English students were admitted, and in 1765, £1,000 was raised in England and placed in charge of trustees. It was named after the Earl of Dartmouth. The present site was chosen in 1769 and the first students were graduated in 1771. A suit for the control of the college was instituted between the state and the college, and decided in 1819 in favor of the trustees. Daniel Webster was attorney for the college. There is a medical department, school of science and art, college of agriculture and mechanical arts, and civil engineering school. The income is $75,000; students, 560; professors, 48: books, 75,000.

Darwen, Over, a borough of Lancashire, England, 3½ mi. s. of Blackburn. Until about the middle of this century Over Darwen was an insignificant village; now it is a populous and thriving town. The staple manufacture is cotton; other manufactures are paper, iron castings, earthenware, etc. Pop. 34,192.

Dar′win, Charles Robert (1809–1882), a noted English naturalist. He early devoted himself to the study of natural history, and in 1831 he was appointed naturalist to the surveying voyage of H.M.S. *Beagle*, commanded by Captain Fitzroy. Darwin came home with rich stores of knowledge, part of which he soon gave to the public in various works. In 1839 he married his cousin, Emma Wedgwood, and henceforth spent the life of a quiet country gentleman, engrossed in scientific pursuits—experimenting, observing, recording, reflecting, and generalizing. In 1859 his name attained its great celebrity by the publication of *The Origin of Species by Means of Natural Selection.* This work, scouted and derided though it was at first in certain quarters, may be said to have worked nothing less than a revolution in biological science. In it for the first time was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection. The rest of his works are largely based on the material he had accumulated for the elaboration of this great theory. The principal are a treatise on the *Fertilization of Orchids* (1862); *Domesticated Animals and Cultivated Plants;* or *The Principle of Variation, etc., under Domestication* (1867); *Descent of Man and Variation in Relation to Sex* (1871); *The Expression of the Emotions in Man and Animals* (1872); *Movements and Habits of Climbing Plants* (2d. ed. 1875); *Insectivorous Plants* (1875); *Cross and Self Fertilization* (1876); *The Power of Movement in Plants* (1880); *The Formation of Vegetable Mold* (1881), the last containing a vast amount of information in regard to the common earthworm. Mr. Darwin was buried in Westminster Abbey.

Dar′winism, the views, especially regarding the origin and development of animals and plants, expressed in detail and advocated with much earnestness in the works of Charles Darwin. What has come to be known as "the Darwinian theory" is the position that all forms of living organism, including man, have been derived or evolved through heredity, from certain primitive states or conditions of existence, during the struggle for existence of individual organisms, which results, through natural selection, in the survival of those least exposed, or, in the words of the distinguished author, "the survival of the fittest." Mr. Darwin especially advocated, as distinct from other writers on biology and evolution, these ideas: the inherent susceptibility and tendency to variation according to conditions of environment; the preservation and perfection of organs best suited to the needs of the individual in its struggle for existence; the perpetuation of the more favorably organized beings, and the destruction of those less fitted to survive; the operations of natural selection, in which sexual selection is an important factor, and the general proposition that at any given time any given organism represents the result of the foregoing factors, acting in opposition to the hereditary tendency to adhere to the type, or "breed true." See *Evolution.*

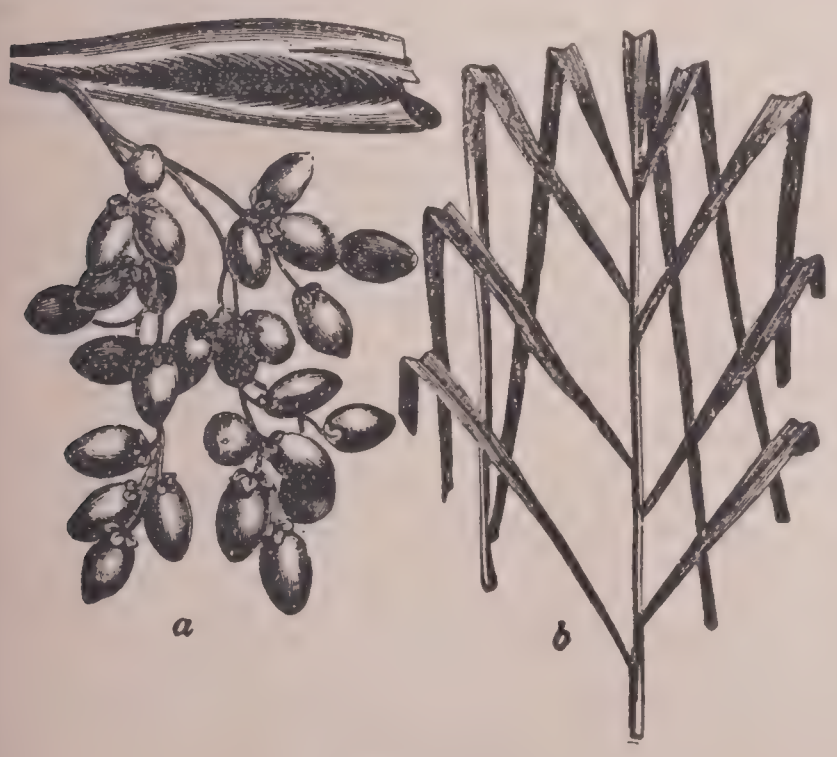
Dass, Peter (1647–1708), Norwegian poet, of Scottish extraction He is known as the "father of Norwegian poetry," and his principal poem, *The Trumpet of Northland*, is one of the most favorite national poems.

Das′yure (dasyu′rus), the brush-tailed opossums, a genus of plantigrade marsupials found in Australia and Tasmania, and so named in contrast to the opossums of this country which have naked tails somewhat like rats. The ursine dasyure of Tasmania is about the size of a badger, but of a sturdier form, of a dull black color, carnivorous, and of a savage temper. Formerly it was most destructive to flocks and poultry yards, but is now in the inhabited districts nearly extirpated. The various species of the genus have much the same nature and habits as the European polecat.

Tasmania Devil.

Date, the fruit of the date palm or the tree itself. The fruit is used extensively as an article of food by the natives of Northern Africa and of some countries of Asia. It consists of an external pericarp, separable into three portions, and covering a seed which is hard and horny in consequence of the nature of the albumen in which the embryo plant is buried. Next to the cocoanut tree the date is unquestionably the most interesting and useful of the palm tribe. Its stem shoots up to the height of 50 or 60 ft. without branch or division, and of nearly the same thickness throughout its length. From the summit it throws out a magnificent crown of large feather-shaped leaves, and a number of spadices, each of which in the female plant bears a bunch of from 180 to 200 dates, each bunch weighing from 20 to 25 lbs. The fruit is eaten fresh or dried. Cakes of dates pounded and kneaded together are the food of the Arabs who traverse the deserts. A liquor resembling wine is made from dates by fermentation. Persia, Palestine, Arabia, and the north of Africa are best adapted for the culture of the date tree, and its fruit is in these countries an important article of food.

Date plum, the name given to several species of *Diospyros*, a genus of trees of the ebony family. The European date plum is the *D.*



Date Palm.
a.—Bunch of dates; *b.*—Portion of leaf.

Lotus, a low-growing tree, native of the south of Europe. It produces a small fruit, the supposed lotus of the ancients. The American date plum, or persimmon, attains a height of 50 or 60 ft.; the fruit is nearly round, about an inch in diameter, is very austere, but edible after being frosted. The Chinese date plum is cultivated for the sake of its fruit, which is about the size of a small apple, and is made into a preserve.

Dath′olite, the siliceous borate of lime, a mineral of a white color of various shades found in Scotland and on the Continent; also near Lake Superior, where it is used in the manufacture of boracic acid.

Daudet (dō-dā), Alphonse, French novelist, b. at Nîmes 1840. He settled in Paris in 1857, and wrote poems, essays, plays, etc., without much success, till he discovered his powers as a novelist, when he speedily rose to the highest rank. His elder brother, Ernest Daudet, b. 1837, has also distinguished himself as a novelist and one of the best known political writers of the republican party. D. 1897.

Dau′phin, the title of the eldest son of the king of France prior to the revolution of 1830, said to be derived from the dolphin, the crest of the lords of Dauphiny. The name was assumed toward the middle of the ninth century by the lord of Dauphiny, which province was bequeathed by Humbert II to the king of France in 1349, on condition that the heir of the throne should bear the title of Dauphin of Viennois.

Dauw (da′u) (or Peechi) (*Equus Burcheli*), a species of Zebra which inhabits the plains of Southern Africa, particularly to the n. of the Orange River. Its general color is a pale brown, with grayish-white on the abdomen and inner parts of the limbs. Its head, neck, and body, and the upper parts of its limbs are striped like the zebra, but the stripes are not so dark in color.

Dav′enant, Sir William (1605–1688), English poet and dramatist. He flourished under Charles II. His works consist of dramas. masques, addresses, and the epic *Gondibert*, which was never finished, but he is remembered chiefly by the travesty of Shakespeare's *Tempest*, made in conjunction with Dryden. He was buried in Westminster Abbey.

Davenport, Scott co., Iowa, on the Mississippi River, 182 mi. w. from Chicago. Railroads: C. R. I. & P.; C. B. & Q.; B. C. R. & N.; C. M. & St. P.; Rock Island & Peoria. The lumber industry employs a great many men, and there are four flouring mills, woolen mill, iron foundry, packing company, and other factories. The surrounding country is agricultural. The town was first settled in 1835 by Col. Geo. Davenport and Antonio LeClair, and became a city in 1839. Population 1900, 35,254.

Davenport, Edward Loomis (1814–1877), b. in Boston, Mass., actor. He was a judicious and finished performer, who never rose to particular distinction. "St. Marc," in a play of his own; "Hamlet," "Sir Giles Overreach," and "William," in *Black Eyed Susan*, were

among his best performances. His wife, Fanny Elizabeth Vining, b. in 1819, was associated with him in his starring engagements.

Davenport, Fanny, daughter of the foregoing, b. in London, England, April 10, 1850, went on the stage as a child, and became a star. She married in 1879 an actor named Edwin H. Price. D. 1899.

David, king of Israel, the youngest son of Jesse, a citizen of Bethlehem, and descended through Boaz from the ancient princes of Judah. The life of David is recorded in the first and second books of Samuel and the first book of Chronicles. The book of *Psalms*, a large portion of which has been attributed to him, also contains frequent allusions to incidents in his life. He reigned from 1055 B. C. to 1015 B. C. according to the usual chronology, but recent investigations put the dates of David's reign from 30 to 50 years later. Under David the empire of the Israelites rose to the height of its power, and his reign has always been looked on by the Jews as the golden age of their nation's history.

David, Jacques Louis (1748–1825), founder of the modern French school of painting. He went to Rome in 1774, and passed several years there painting several important pictures. A second visit produced the *Horatii*, one of his masterpieces. In 1787 he produced *The Death of Socrates*, in 1788 *Paris and Helen*, and in 1789 *Brutus*. He was appointed first painter to Napoleon about 1804; and after the second restoration of Louis XVIII he was included in the decree which banished all regicides from France, when he retired to Brussels.

David, Pierre Jean (1789–1856), a French sculptor, born at Angers. In 1831 he began the magnificent sculptures of the Pantheon, his most important work, which he finished in 1837. He executed a great number of medallions, busts, and statues of celebrated persons of all countries.

David, Saint, patron of Wales, archbishop of Caerleon, and afterward of Menevia, now St. David's, where he d. about 601. He was celebrated for his piety, and many legends are told of his miraculous powers.

Davis, David (1815–1886), jurist, b. in Cecil co., Md. He studied law in Massachusetts and Connecticut, and removed to Illinois in 1835. In 1844 he was a member of the state legislature, and from 1848 was circuit judge. In October, 1862, President Lincoln appointed him associate justice of the Supreme Court. Judge Davis was nominated by the labor reformers for president in 1872. In March, 1877, he took his seat in the U. S. Senate.

Davis, Henry Winter (1817–1865), statesman, was b. in Annapolis, Md. As member of Congress was a brilliant orator. Although representing a slave state he was unfaltering in fidelity to the Union and a strenuous advocate of emancipation, and as early as 1865 favored negro suffrage.

Davis, Jefferson (1808–1889), president of the Confederate States of America during the Civil War; b. in Kentucky. He was trained at West Point Military Academy, and from 1828 to 1835 saw a good deal of service on the frontier. At the latter date he became a cotton planter in the state of Mississippi. He was elected to Congress in 1845, but at the commencement of the Mexican War he left Congress and engaged actively in the contest. He entered the Senate in 1847, and held various posts in the government, upholding the policy of the slave states and the doctrine of states rights. On the outbreak of the Civil War he was chosen president of the Southern states, was taken prisoner after the fall of Richmond, imprisoned for two years in Fortress Monroe, and set at liberty by the general amnesty of 1868.

Davis, Jefferson C. (1829–1879), soldier, b. in Clark co., Ind. He fought in the Mexican War and received a commission in the regular army. In April, 1861, he was at Fort Sumter, and later commanded a division in Tennessee. He was with Sherman's army in the march to the sea, and in 1865 received a major general's brevet and became colonel of the Twenty-third Infantry.

Davis, John Chandler Bancroft, jurist, b. in Worcester, Mass., in 1822; acted as agent for the U. S. before the Geneva court of arbitration. In 1869 and again in 1873, he was assistant secretary of state. He was next minister to Berlin (1872–1877), then judge of the Court of Claims (1877–1882), and reporter of the U. S. Supreme Court.

Davis, Noah, b. in Haverhill, N. H., in 1818. In July, 1870, he became U. S. district attorney for the southern district of New York, and in 1872 was again elected to the State Supreme Court of which he became presiding justice in 1874. He retired from the bench in 1887.

Davis's Strait, a narrow sea which separates Greenland from Baffin's Land, and unites Baffin's Bay with the Atlantic Ocean.

Davitt, Michael, b. in 1846 in county Mayo, Ireland. In 1870 he was sentenced to fifteen years' imprisonment for treason-felony, but was released in 1878. The next year he founded, in conjunction with Charles S. Parnell, the Irish land league. He made a tour of the U. S. on behalf of that organization in 1880; and on his return to England was again arrested on his old sentence, and held in prison for fifteen months. While he was in prison, he was elected a member of Parliament, but was not permitted to take his seat.

Davos (dȧ-vōs′), an elevated valley of Switzerland, canton Grisons, containing several villages; a winter resort of persons suffering from chest diseases.

Davout (or Davoust) (dä-vö), Louis Nicolas, duke of Auerstädt and prince of Eckmühl, marshal and peer of France (1770–1823). He went with Bonaparte to Egypt in 1798, and commanded the cavalry of the army of Italy in 1800. He shared the glory of Eylau, Eckmühl, and Wagram; was made governor of Hamburg; took part in the Russian campaign of 1812, and was wounded at Borodino. During the Hundred Days (1815) he was Napoleon's

minister of war, and after Waterloo, was appointed by the provisional government general-in-chief of the French armies.

Da'vy, Sir Humphry (1778–1829), a distinguished English chemist. He was appointed professor of chemistry in the Royal Institution at the age of twenty-four. In 1803 he was chosen a member of the Royal Society. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and ascertaining their metallic bases, his demonstration of the simple nature of the oxymuriatic acid, etc., obtained him an extensive reputation. The numerous accidents arising from fire-damp in mines led him to enter upon a series of experiments on the nature of the explosive gas, the result of which was the invention of his safety lamp.

Da'vyum (after Sir H. Davy), a metal of the platinum group discovered in 1877. It is a hard, silvery metal, slightly ductile, extremely infusible.

Dawes, Henry L., U. S. Senator from Massachusetts, was b. in Cummington, Mass., Oct. 30, 1816. He graduated at Yale College and studied law. After serving as member of House for seven consecutive terms, in 1874 elected U. S. Senator; re-elected 1881 and 1887.

Dawson, Henry (1811–1878), English landscape painter. Among the best of his pictures are *Wooden Walls of Old England, London from Greenwich Hill, Houses of Parliament, The Rainbow, Rainbow at Sea, The Pool Below London Bridge.*

Dawson, Sir John William, b. 1820 at Picton, Nova Scotia; Canadian geologist. He was educated at Picton and Edinburgh University. He accompanied Sir Charles Lyell when examining the geology of Nova Scotia in 1842. In 1850 he became superintendent of education for Nova Scotia, and in 1855 principal and professor of natural history in M'Gill College, Montreal, in which position, as well as in that of vice-chancellor, and, latterly, principal of the university, his services in the cause of education have been very marked. He became a member of the Royal Society in 1862.

Day, either the interval of time during which the sun is continuously above the horizon, or the time occupied by a revolution of the earth on its axis, embracing this interval, as well as the interval of darkness. The day in the latter sense may be measured in more than one way. If we measure it by the apparent movement of the stars, caused by the rotation of the earth on its axis, we must call day the period between the time when a star is on the meridian and when it again returns to the meridian; this is a *sidereal* day. It is uniformly equal to 23 hours, 56 minutes, 4,098 seconds. But more important than this is the *solar day*, or the interval between two passages of the sun across the meridian of any place. The latter is about four minutes longer than the former, owing to the revolution of the earth round the sun, and it is not of uniform length, owing to the varying speed at which the earth moves in its orbit and to the obliquity

of the ecliptic. For convenience an average of the solar day is taken, and this gives us the *mean solar* or *civil day* of twenty-four hours, the difference between which and the actual solar day at any time is the *equation of time.* The length of the days and nights at any place varies with the latitude and season of the year, owing to the inclination of the earth's axis. In the first place, the days and nights are equal all over the world on the 21st of March and the 21st of September, which dates are called the *vernal* (spring) and *autumnal equinoxes.* Again, the days and nights are always of equal length at the equator, which, for this reason, is sometimes called the *equinoctial* line. With these exceptions, we find the difference between the duration of the day and the night varying more and more as we recede from the equator.

The Babylonians began the day at sunrising; the Jews at sunsetting; the Egyptians and Romans at midnight, as do most modern peoples. The civil day in most countries is divided into two portions of twelve hours each. The abbreviations P.M. and A.M. (the first signifying *post meridiem*, Latin for *afternoon*; the latter *ante meridiem, forenoon*) are requisite, in consequence of this division of the day. The Italians in some places reckon the day from sunset to sunset, and enumerate the hours up to twenty-four; the Chinese divide it into twelve parts of two hours each. For astronomical purposes the day is divided into twenty-four hours instead of two parts of twelve hours. Formerly it began at noon, but since Jan. 1, 1885, the day of twenty-four hours begins at midnight at Greenwich observatory; and this reckoning is now generally adopted for astronomical purposes elsewhere than at Greenwich. The Greenwich day practically determines the date for all the world. At mid-day at Greenwich the date (day of the week and month) is everywhere the same, though there are all possible differences in naming the hour of the day. But mid-day at Greenwich is the only instant at which we ever have the same date all over the world. The meridian of midnight, which is then at 180° e. or w., goes on revolving, gradually bringing a new date to every place to the west of that line, but obviously not bringing that new date to the places immediately to the east of that line till twenty-four hours after. From this it follows that whereas places on the one side of the globe never have a different date except when midnight lies between them, places on the opposite side of the globe, and on different sides of the meridian of 180° e. or w., never have the same date except when midnight lies between them.

Day, William R., was born at Ravenna, Ohio, in 1849, graduated at the University of Michigan in 1870, and was admitted to the bar two years later. He practiced law at Canton, Ohio, until 1886, when he was elected judge of the common pleas court. He was appointed judge of the U. S. District Court of Northern Ohio by President Harrison in 1889, but ill health caused him to resign before taking office. He was appointed first assistant secretary of state in April, 1897, and became secre-

tary of state upon the resignation of John Sherman, April, 1898. This position he resigned to act as chairman of the Spanish-American Peace Commission. He was appointed U. S. circuit judge of the Sixth Judicial Circuit by President McKinley, Feb. 25, 1899.

Day-lily, the popular name for a genus of lilies, natives of temperate Asia and Eastern Europe, two species of which are grown in gardens. They have long radical leaves, and a branched, few-flowered scape, with large handsome blossoms, the segments of which are united into a tube.

Yellow Day-lily.

Dayton, William Lewis (1807–1864), statesman, b. in N. J. He graduated at Princeton in 1825; studied law and began practise in Trenton, N. J., in 1830. He was appointed to the U. S. Senate in 1842 to fill a vacancy, and was re-elected in 1845. In 1856 he was nominated for vice president on the ticket with John C. Fremont. In 1857 he became attorney general of N. J., and in 1861 was appointed minister to France, which office he held until his death.

Dayton, county seat Montgomery co., O., on the great Miami River, 60 mi. n.e. of Cincinnati. Railroads: P. C. C. St. L. (Pa.); C. H. & D.; C. C. C. & St. L. (Big Four); and Erie. Industries: car works, three factories for the manufacture of agricultural implements, sewing machine, bicycle, refrigerator, pump, linseed oil, and paint factories. Natural gas is pumped from Indiana and the Mercer co. fields. Surrounding country agricultural. First settled in 1796 and became a city in 1805. Dayton celebrated its 100th anniversary in 1896. Three lines of electric cars run to the National Soldiers' Home which is three miles from the center of the city, and embraces over 600 acres of natural and beautiful grounds. Dayton has seven banks, a clearing house, and a number of building and loan associations. Pop. 1900, 85,353.

Dead-letter, a letter which lies for a certain period uncalled for at the post-office, or one which cannot be delivered from defect of address, and which is sent to the general post-office to be opened and returned to the writer. *Dead-letter office,* a department of the general post-office where dead-letters are examined and disposed of.

Dead-nettle, the common name of a species of plants. There are several species found in the U. S. and England as the white dead-nettle, the red, and the yellow.

White Dead-nettle.

Dead Reckoning, the calculation of a ship's place at sea without any observation of the heavenly bodies. It is obtained by keeping an account of the distance which the ship has run by the log, and of her course steered by the compass, and by rectifying these data by the usual allowance for drift, leeway, etc., according to the ship's known trim.

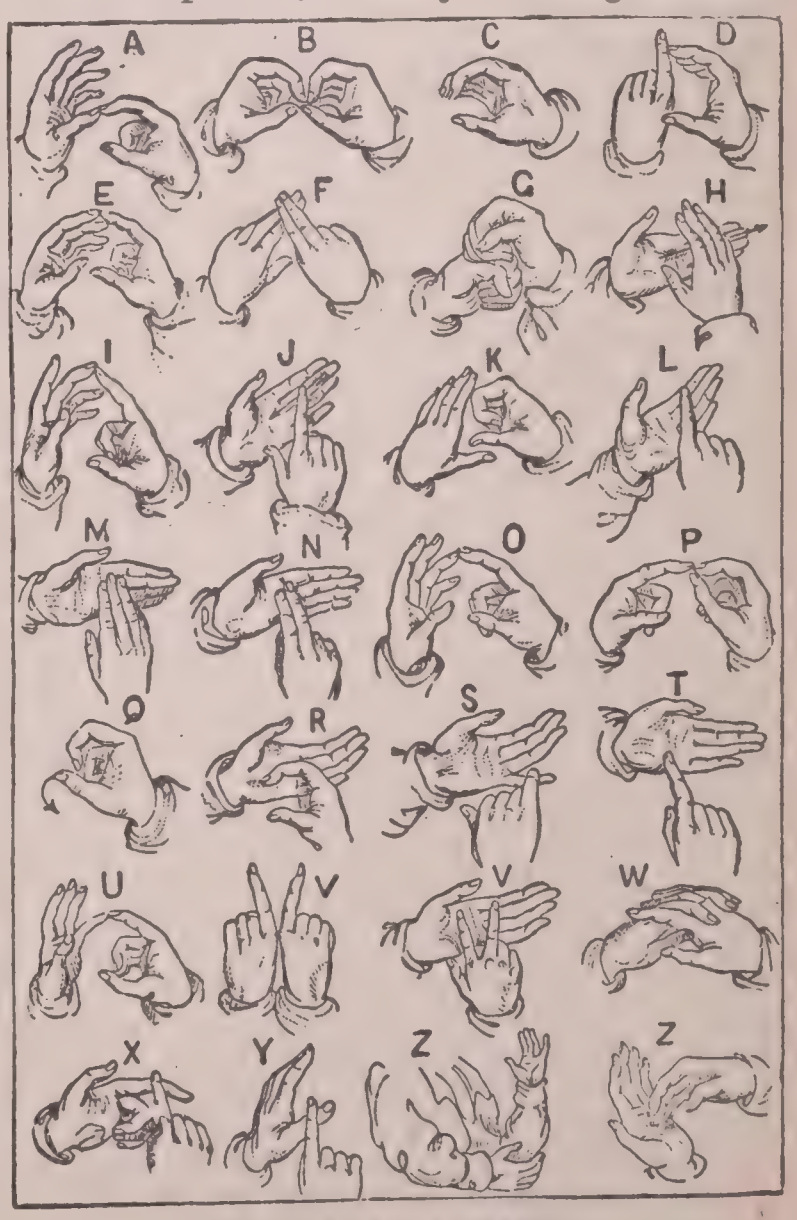
Dead Sea, called in Scripture "Salt Sea," "Sea of the Plains," and "East Sea," a celebrated lake in Asiatic Turkey, near the south extremity of Palestine, in the pashalic of Damascus. The north extremity is 25 mi. e. of Jerusalem and 10 mi. s.e. of Jericho; length about 46 mi.; breadth at the widest part, 9 to 10; average, about 8½ mi. The basin in which the Dead Sea reposes forms the south termination of the great depression through which the Jordan flows, that river entering it at its north extremity. It receives several other tributaries, but has no outlet. The surface is 1,312 ft. below the level of the Mediterranean. It lies deeply imbedded between lofty cliffs of naked limestone, its shores presenting a scene of indescribable desolation and solitude, encompassed by desert sands, and bleak, stony, salt hills. Sulphur and rock salt, lava and pumice abound along its shores. The water is nauseous to the taste and smell, and so buoyant that the human body will not sink in it. At about a third of its length from the north end it attains a maximum depth of 1,308 ft. The southern portion is a mere lagoon, 12 ft. deep in the middle and 3 at the edges.

Deaf and Dumb (or Deaf-mutes), persons both deaf and dumb, the dumbness resulting from deafness which has either existed from birth or from a very early period of life. Such persons are unable to speak simply because they have not the guidance of the sense of hearing to enable them to imitate sounds. Among the causes assigned for congenital deafness are consanguineous marriages, hereditary transmission, scrofula, certain local or climatic conditions, ill health of the mother

during pregnancy, etc. Acquired or accidental deafness, which occurs at all ages, is frequently due to such diseases as smallpox, measles, typhus, paralysis, hydrocephalus, and other cerebral affections, but more particularly to scarlet fever, which is somewhat apt to leave the patient deaf owing to the inflammatory state of the throat extending to the internal ear, and thus causing suppuration and destruction of the extremely delicate parts of the auditory apparatus. In the greater proportion of deaf-mutes no defect is visible, or can be detected by anatomical examination, and no applications yet discovered appear to be useful. The necessity of communication, and the want of words, oblige the deaf-mute to observe and imitate the actions and expressions which accompany various states of mind and of feeling, to indicate objects by their appearance and use, and persons by some peculiar mark, and to describe their actions by direct imitation. In this way he and his friends are led to form a dialect of that universal language of attitude, gesture, and expression which becomes a substitute for words in the hands of the pantomimic actor, and which adds force and clearness to the finest effusions of the orator; in other words, the natural *sign-language.* This language, in its elements, is to be found among all nations, and has ever been the medium of communication between voyagers and the natives of newly discovered countries. It is employed by many savage tribes to supply the paucity of expression in their language and to communicate with other tribes. Among some of the Indians it exists as a highly-organized language. Such a means of communication is after all very imperfect, however, and various more perfect systems have been devised to enable deaf-mutes to communicate with one another and with the rest of mankind, and thus to gain such an education as people in general possess. In 1648 John Bulwer published the earliest work in English on the instruction of the deaf and dumb. In 1743 the practicability of instructing deaf-mutes was first publicly demonstrated in France by Pereira, a Spaniard, before the Academy of Sciences, which gave its testimony to the success of the method. About the same time the Abbé de l'Epée, who devoted his life and fortune to this subject, introduced a system for the instruction of the deaf and dumb, which was taught with great success in the Royal Parisian Institution, and afterward still further developed by his pupil and successor, the Abbé Sicard. In 1779 a public institution for the education of deaf-mutes was established at Leipsic, through the labors of Samuel Heinicke, the great upholder of the vocal or articulatory system, which is still retained at Vienna and throughout Germany. The first public institution in Great Britain for the gratuitous education of the deaf and dumb was founded at Bermondsey in 1792. From this establishment originated the London Asylum in Kent Road, which was opened in 1807. American institutions have munificent state

Deaf and Dumb

endowments and are admirably managed. Deaf-mutes are "the wards of the commonwealth" and every state in the Union provides for its own, either by establishing schools or by appropriations to schools already established in other states. The Asylum at Hartford, Conn., was founded in 1817. This was the first school for the instruction of deaf-mutes opened in this country. In 1819 this institution received a grant of government land which now yields a fund of over $300,000. The second school was opened in New York City in 1818. Since that time many institutions have sprung up in other states. The Clarke Institute at Northampton, Mass., for instructing deaf-mutes was organized in 1867. It differed from other American institutions in that pupils were received at the legal school age, instead of later, and instructed by articulation and lip-reading, a method borrowed from the Germans. At a conference of instructors in Washington a resolution was passed recommending the use of articulation and lip-reading in connection with the manual method in all the schools in the U. S. The two systems are now combined in nearly all the schools throughout the country. The U. S. has a National College located at Washington. *The American Annals of the Deaf and Dumb* has been published since 1847, and conventions of instructors have been held since 1850. The two chief methods of conveying instruction to the deaf and dumb are by means of the manual alphabet, and by training them to



Two-handed alphabet.

watch the lips of the teacher during articulation. There are two kinds of manual alphabet: the double-handed alphabet, where the letters are expressed by the disposition of the fingers of both hands; and the single-handed, in which the letters are formed with the fingers of one hand. Particular gestures which are attached to each word as its distinctive sign are largely used, as are also real objects and models, pictures, etc. The method of teaching by articulation, the pupil learning to recognize words, and in time to utter them, by closely watching the motions of the lips and tongue in speech, and by being instructed through diagrams as to the different positions of the vocal organs, is now receiving much attention, and has given excellent results, cases being known where persons have conversed with the deaf and dumb and remained ignorant that those to whom they were speaking were afflicted in this way. It is by no means a novel system, but of late it has vastly increased in favor with authorities. A new mode of teaching articulation has recently been brought into notice, consisting in the use of the system of *visible speech*. The characters of the alphabet on which this system is founded are intended to reveal to the eye the position of the vocal organs in the formation of any sound which the human mouth can utter. Its practical value as a means of instruction with all classes of the deaf and dumb has not as yet been sufficiently tested.

Deal, the division of a piece of timber made by sawing; a board or plank. The name deal is chiefly applied to boards of fir above 7 in. in width and of various lengths exceeding 6 ft. If 7 in. or less wide they are called battens, and when under 6 ft. long they are called dealends. The usual thickness is 3 in., and width 9 in. The standard size, to which other sizes may be reduced, is 1½ in. thick, 11 in. broad, and 12 ft. long. *Whole deal* is deal which is 1½ in. thick; *slit deal*, half that thickness.

Deal-fish, so called from its excessively compressed body, a denizen of the northern ocean and an occasional visitor to the coasts of Iceland, Norway, and Britain; measures from 4 to 8 ft. in length, is of a silvery color with minute scales, and has the dorsal fin extended along the whole length of the back. It is also known by the Scandinavian name Vaagmaer.

Deane, Silas (1737–1789), b. in Greton, Conn., diplomatist. He graduated at Yale in 1758. In 1768 he was elected to the legislature, and in 1774 to the Continental Congress. He bought the first vessel for the American navy. In 1779 he was discharged from Congress. He died in England.

Dean Forest, England, county of Gloucester. It formerly comprised the greater part of the county w. of the Severn, but is now reduced to about 22,000 acres, nearly one half of which is enclosed, and was formerly appropriated for the growth of navy timber, but is now mainly covered with coppices. This district is crown property, and the inhabitants enjoy many ancient privileges. It contains a population of nearly 25,000.

Dearborn, Henry (1751–1829), soldier. He served in Colonel Stark's regiment, took part in the battle of Bunker Hill, and accompanied Arnold to Quebec, where he was captured. He was released on parole in 1776, and exchanged in 1777. He served in General Gates's army; took part in the battle of Monmouth; served in Sullivan's expedition against the Indians in 1779; was with the army in N. J. in 1780; and accompanied General Washington to Yorktown. After the war Washington appointed him marshal of the district of Maine. In 1793, he was elected to Congress, and served two terms. He was secretary of war from 1801 till 1809, when he was made collector of the port of Boston. In 1812 he was made senior major general of the U. S. army. In 1813 he went with his army to Canada and captured York and took Fort George. In 1813 he was placed in command of the military district of New York City. From 1822 till 1824 was minister to Portugal.

Death's-head Moth, one of the largest species of lepidopterous insects. The markings upon the back of the thorax very closely resemble a skull, or death's-head. It measures from 4 to 5 inches in expanse. It emits

Death's-head Moth and Caterpillar.

peculiar sounds, somewhat resembling the squeaking of a mouse, but how these are produced naturalists have not been able satisfactorily to explain. It attacks bee-hives, pillages the honey, and disperses the inhabitants.

Deathwatch, a coleopterous insect that inhabits the woodwork of houses. In calling to one another they make a peculiar ticking sound, which superstition has interpreted as a forerunner of death.

Debenture, a declaratory deed given by a public company in acknowledgment of borrowed money. It gives the holder the first claim for dividends, while the capital sum lent is usually assured on the security of the whole undertaking. With the deed, coupons or war-

rants for the payment of interest at specified dates are generally issued.

Deb'orah, a Hebrew seer or prophetess who lived in the time of the judges; by the aid of Barak delivered the northern tribes from the oppression of Jabin, and secured a peace of 40 years' duration.

Debra Tabor, a town in Abyssinia, about 35 mi. e. of Lake Dembea, the residence of the Abyssinian sovereign.

Debreczin (de-bret'sin), a town of Hungary, on the edge of the great central plain, 113 mi. e. of Budapest. Its houses are mostly of a single story; the streets broad and unpaved. Among the principal edifices are the Protestant church and college. Chief manufactures are coarse woolens, leather, soap, tobacco pipes, casks, etc., and a large trade is done in cattle. Pop. 56,940.

Debt, National. See *National Debt.*

Decalogue (dek'a-log) (Gr. *deka,* ten, and *logos* a word), the ten commandments, which according to Exodus 20 and Deuteronomy 5 were given by God to Moses on two tables. The Jews call them the *ten words.* Jews and Christians have divided the ten commandments differently; and in some Catholic catechisms the second commandment has been united with the first, and the tenth has been divided into two.

De Candolle (dē'kän-dol), Augustin Pyrame (1778–1841), one of the most illustrious of modern botanists, whose natural system of classification, with some modifications, is the one still generally used, was b. at Geneva. In 1808 he obtained the chair of botany in the faculty of medicine at the University of Montpellier. In 1816 he went to Geneva, where a chair of natural history was expressly created for him, and where he continued for many years to extend the boundaries of his favorite science by his lectures and publications.

Decap'oda. 1, The highest order of crustaceans, so called from having five pairs of legs. They are subdivided into the short-tailed decapods or crabs; long-tailed, including the shrimp, lobster, prawn, crayfish, etc.; and Anomura, of which the hermit-crab is an example. 2, One of the two divisions of the dibranchiate cuttlefishes. They have two arms longer than the other eight, and bear the suctorial discs only at the extremities.

Decatur, Macon co., Ill., on Sangamon River. Railroads: Illinois Central; Wabash; and three other lines. Industries: flour mills, furniture, linseed oil and cotton factories, farming implements, carriage and iron works. There are coal mines in the vicinity. Population 1900, 20,754.

Decatur, Stephen (1779–1820), b. in Sinnepuxent, Md.; naval officer. In 1799 he became a lieutenant, and in 1801 sailed in the *Essex* to Tripoli. In 1803, he was given command of the *Enterprise.* In 1812, while commander of the frigate *United States,* he encountered the British frigate *Macedonian,* and captured her. On his way to sea through Long Island Sound, in 1813, Decatur's vessel was blockaded by the British fleet, and he was driven into New London. In 1815, he was sent with a squadron of nine vessels to the Mediterranean, where he captured an Algerine frigate. On June 28, he captured a second vessel, and anchoring his squadron in the harbor of Algiers, compelled the dey to negotiate a treaty. He then entered Tunis and Tripoli, forced the release of the American prisoners, and obtained satisfaction for past offenses. Returning to the U. S., he was made a naval commissioner. His death was caused by a wound received in a duel with Commodore Barron, near Bladensburg, D. C.

Dec'can, a term locally limited to the territory of Hindustan lying between the Nerbudda and the Kistna, but generally understood to include the whole country south of the Vindhya Mountains, thus comprising the presidency of Madras and part of Bombay, Hyderabad, Mysore, Travancore, and other native states.

Decem'ber, the twelfth month of our year, from the Latin *decem,* ten, because in the Roman year instituted by Romulus it constituted the tenth month, the year beginning with March. In December the sun enters the tropic of Capricorn, and passes the winter solstice.

Decem'virs, the ten magistrates who had absolute authority in ancient Rome (B.C. 451–449).

Decid'uous is a term applied in botany to various organs of plants, particularly leaves, to indicate their annual fall. A tree of which the leaves fall annually is called a deciduous tree, and the same term is applied to the leaves themselves. The term is also applied in zoology to parts which fall off at a certain stage of an animal's existence, as the hair, horns, and teeth of certain animals.

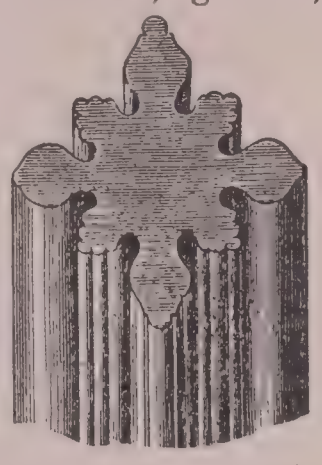
Declaration of Independence, the solemn declaration of the Congress of the U. S. A., on July 4, 1776, by which they formally renounced their subjection to the government of Britain. (For text see *U. S.*) *Declaration of Paris,* an instrument signed at the Congress of Paris, 1856, and subsequently accepted by the chief powers. It declared: 1, privateering to be abolished; 2, a neutral flag covers enemy's goods, with the exception of contraband of war; 3, neutral goods, except contraband of war, are not liable to capture under an enemy's flag; and 4, blockades, in order to be binding, must be effective. *Declaration of War,* the formal notice which, by the usage of nations, belligerents are expected to give before commencing hostilities.

Declination, in astronomy, the distance of a heavenly body from the celestial equator (equinoctial), measured on a great circle passing through the pole and also through the body. It is said to be north or south according as the body is north or south of the equator. Great circles passing through the poles, and cutting the equator at right angles, are called *circles of declination.* Twenty-four circles of declination, dividing the equator into twenty-four arcs of 15° each, are called hour circles or horary circles. Declination of the compass or needle,

or *magnetic declination*, is the variation of the magnetic needle from the true meridian of a place. This is different at different places, and at the same place at different times.

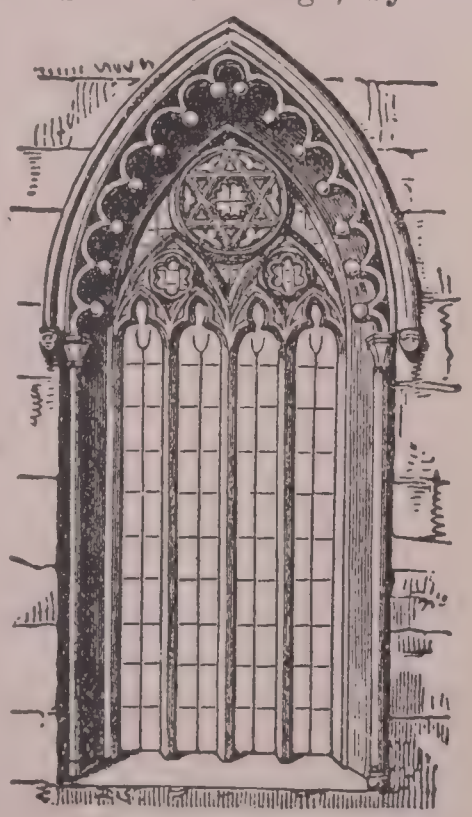
Declinom′eter, an instrument for determining the magnetic declination, and for observing its variations. In magnetic observatories there are permanent instruments of this kind, and they are now commonly made self-registering. Such instruments register the small hourly and annual variations in declination, and also the variations due to *magnetic storms*.

Decomposition, Chemical, is the separation of the constituents of a body from one another. Roughly speaking—for it is a difference of degree rather than of kind—decomposition is either artificial or spontaneous. Artificial decomposition is produced in bodies by the action of heat, light, electricity, or chemical re-agents; spontaneous, in bodies which quickly undergo change in ordinary circumstances, unless special precautions are taken to preserve them. The bodies of the mineral, and the definite crystallized principles of the organic world, belong to the first; organized matter, such as animal and vegetable tissues, organic fluids, such as blood, milk, bile, and the complex non-crystallized bodies, albumen, gelatin, emulsine, etc., belong to the second.



Column, Fourteenth Century.

Dec′orated Style, in architecture, the second style of pointed (Gothic) architecture, in use in Great Britain from the end of the thirteenth to the beginning of the fifteenth century, when it passed into the Perpendicular. It is distinguished from the Early English, from which it was developed, by the more flowing or wavy lines of its tracery, especially of its windows, by the more graceful combinations of its foliage, by the greater richness of the decorations of the capitals of its columns, and of the moldings of its doorways and niches, finials, etc., and generally by a style of ornamentation more profuse and naturalistic, though perhaps somewhat florid. The most distinctive ornament of the style is the ball flower, which is usually inserted in a hollow molding. The decorated style has been divided into two periods; viz., the *Early* or *Geometrical Decorated* period, in which geometrical figures are largely introduced in the ornamentation; and the *Decorated style* proper, in which the peculiar characteristics of the style are exhibited. To this latter period belong some of the finest monuments of British architecture.



Window, Oxfordshire, 1300.

Decoration Day. The custom of decorating the graves of fallen soldiers originated in the South, where, for several years after the late Civil War, it was observed with reverence and devotion, and with befitting public exercises. The practise was also followed privately in the North for some years after the close of the war; but in 1868 General Logan then commanding the Grand Army of the Republic, by the following official order, made the observance a national one, declaring it to be his "purpose to inaugurate this observance with the hope that it may be kept up from year to year:"—

"The 30th of May, 1868, is designated for the purpose of strewing with flowers or otherwise decorating the graves of comrades who died in defense of their country during the late Rebellion, and whose bodies now lie buried in almost every city, village, hamlet, and churchyard in the land. In this observance no form of ceremony is prescribed, but posts and comrades will in their own way arrange such fitting services and testimonials of respect as cirumstances will permit.

"John A. Logan,
"*Commander-in-Chief G. A. R.*"

Since the issuance of this order the observance of the day thus set apart has constantly increased throughout the country. At first the occasion was called *Memorial Day*, but *Decoration Day* is now the appellation generally adopted. Originally different days were observed by different states, notwithstanding the day fixed in General Logan's order; but the 30th of May has now been universally settled upon, and in most of the states, North as well as South, it is made a legal holiday. Of all national observances connected with public events in American history, this appropriate and beautiful custom appears to have taken the deepest hold in the popular heart.

Decoy′, a place into which wild fowls are decoyed in order to be caught. A decoy pond is kept only in a secluded situation. Several channels or pipes of a curved form, covered with light, hooped network, lead from the pond in various directions. The wild fowl are enticed to enter the wide mouth of the channel by tamed ducks, also called decoys, trained for the purpose, or by grain scattered on the water. When they have got well into the covered channel they are surprised by the decoyman and his dog, and driven up into the funnel net, at the far end where they are easily caught. The details differ in different cases, but this is the general principle of the contrivance.

Decrepita′tion, the act of flying asunder with a crackling noise, on being heated, or the crackling noise, attended with the flying asunder of their parts, made by several salts and

minerals when heated. It is caused by the unequal sudden expansion of their substance by the heat, or by the expansion and volatilization of water held mechanically within.

Dedham, Norfolk co., Mass., on the Charles River. Railroads: N. Y. N. H. & H. and N. Y. & N. E. Industries: broom, woolen, suspender manufactories, cocoa and chocolate establishments, and piano works. Pop. 1900, 7,457.

Dee, the name of several British rivers. 1, A river of Scotland, partly in Kincardineshire, but chiefly in Aberdeenshire, one of the most finely wooded and one of the best salmon rivers in Britain. 2, A river of North Wales and Cheshire; rises in Lake Bala, Merionethshire; flows to the Irish Sea, 20 mi. below Chester. 3, A river of Scotland, county of Kirkcudbright, rises in Loch Dee, flows s.e. and s., and falls into Kirkcudbright Bay.

Dee, John (1527–1608), English mathematician, alchemist, and astrologer. In the reign of Mary he was imprisoned on suspicion of practising the "black art;" but was in favor with Elizabeth, who is said to have employed him on secret political missions, and paid him a fixed salary. In 1581 he visited several of the Continental courts, pretending to raise spirits. In 1595 he obtained from the queen the wardenship of Manchester College.

Deed, in law, a writing containing some contract or agreement, and the evidence of its execution made between parties legally capable of entering into a contract or agreement; particularly an instrument on paper or parchment, conveying real estate to a purchaser or donee. It is either an *indenture* or a *deed-poll;* the former made between two or more persons in different interests, the latter made by a single person, or by two or more persons having similar interests.

Deer, a general name for the ungulate or hoofed ruminating animals constituting the family Cervidæ, of which the typical genus is *Cervus*, the stag or red deer. The distinguishing characteristics of the genus are, that the members of it have solid, branching horns which they shed every year, and eight cutting teeth in the lower jaw and none in the upper. The horns or antlers always exist on the head of the male, and sometimes on that of the female. The forms of the horns are various; sometimes they spread into broad palms which send out sharp snags around their outer edges; sometimes they divide very fantastically into branches, some of which project over the forehead, while others are reared upward in the air; or they may be so reclined backward that the animal seems almost forced to carry its head in a stiff, erect posture. They are used as defensive and offensive weapons, and grow with great rapidity. There are many species of deer, as the red deer or stag, the fallow deer, the roebuck, the reindeer, the moose, the elk, the axis, rusa, muntjac, wapiti, etc. Deer are pretty widely distributed over the world, though there are none in Australia and few in Africa, where the antelopes take their place. The reindeer alone has been domesticated.

Deering, Cumberland co., Me., on Casco Bay. Railroads: Maine Central; Grand Trunk; Portland & Rochester. Industries: lumber and manufactures. A part of Portland.

Deer mouse, the common name of the animals belonging to the genus *Meriones*, an American genus of rodent animals allied to the mice and the jerboas of the Old World. The deer mouse of Canada is a pretty little animal of the size of a mouse, with very long hind-legs and tail, and very short fore legs.

Default′, in law, signifies generally any neglect or omission to do something which ought to be done. Its special application is to the non-appearance of a defendant in court when duly summoned on an appointed day. If he fail to appear judgment may be demanded and given against him by default.

Defend′ant, in law, the party against whom a complaint, demand, or charge is brought; one who is summoned into court, and defends, denies, or opposes the demand or charge, and maintains his own right. The term is applied even if the party admits the claim.

Defiance, Defiance co., O., on Maumee River and Wabash & Erie Canal. Railroads: Baltimore & Ohio, and Wabash lines. Industries: lumber mills and woolen factories. In grain-growing district. Pop. 1900, 7,579.

Definition, a brief and precise description of a thing by its properties; an explanation of the signification of a word or term, or of what a word is understood to express. Logicians distinguish definitions into *nominal* and *real.* A nominal definition explains the meaning of a term by some equivalent word or expression supposed to be better known. A real definition explains the nature of the thing. A real definition is again *accidental*, or a description of the accidents, as causes, properties, effects, etc., or *essential*, which explains the constituent parts of the essence or nature of the thing. An essential definition is, moreover, *metaphysical* or *logical*, defining "by the genus and difference," as it is called, as, for example, "a plant is an organized being, destitute of sensation," where the part first of the definition states the genus, and the latter the difference; or *physical*, when it distinguishes the physical parts of the essence; thus, a plant is distinguished by the leaves, stalk, root, etc. A strictly accurate definition can be given of only a few objects. The most simple things are the least capable of definition, from the difficulty of finding terms more simple and intelligible than the one to be defined.

Defoe (dē-fō′), Daniel (1661–1731), an English writer of great ingenuity and fertility, was b. in London. In 1701 appeared his satire in verse, *The True-born Englishman*, in favor of William III. In 1716 he published his largest poem, entitled *Jure Divino*, a satire on the doctrine of divine right. In 1707 he was in Scotland. In 1719 appeared the most popular of all his performances, *The Life and Surprising Adventure of Robinson Crusoe.* After the accession of George I he was employed by government in some underhand work connected with the obnoxious Jacobite press, and was a prolific

contributor to periodical and ephemeral literature.

Degree′, in geometry or trigonometry, the 360th part of the circumference of any circle, the circumference of every circle being supposed to be divided into 360 equal parts, called degrees. A *degree of latitude* is the 360th part of the earth's circumference north or south of the equator, measured on a great circle at right angles to the equator, and a *degree of longitude* is the same part of the surface east or west of any given meridian, measured on a circle parallel to the equator. Degrees are marked by a small ° near the top of the last figure of the number which expresses them; thus, 45° is 45 degrees. The degree is subdivided into sixty equal parts called minutes; and the minute is again subdivided into sixty equal parts called seconds. Thus, 45° 12′ 20″ means 45 degrees, 12 minutes, and 20 seconds. The magnitude or quantity of angles is estimated in degrees and parts of a degree, because equal angles at the center of a circle are subtended by equal arcs, and equal angles at the centers of different circles are subtended by similar arcs; or arcs containing the same number of degrees and parts of a degree. An angle is said to be so many degrees as are contained in the arc of any circle intercepted between the lines which contain the angle, the angular point being the center of the circle. Thus we say an angle of 90°, or of 45° 24′. It is also usual to say that a star is elevated so many degrees above the horizon, or declines so many degrees from the equator, or such a town is situated in so many degrees of latitude or longitude. The length of a degree depends upon the radius of the circle of the circumference of which it is a part, the length being greater the greater the length of the radius. Hence the length of a degree of longitude is greatest at the equator, and diminishes continually toward the poles, at which it = 0. Under the equator a degree of longitude contains 60 geographical, and 69½ statute miles. The degrees of latitude are found to increase in length from the equator to the poles, owing to the figure of the earth. Numerous measurements have been made in order to determine accurately the length of degrees of latitude and longitude at different parts of the earth's surface and thus settle its dimensions and magnitude. When the French determined to establish their system of measures and weights based upon the meter, they settled that this basis was to be the ten-millionth part of the distance from the equator to the pole, which distance had to be found by accurate measurement. Ten degrees of latitude were accordingly measured, from Dunkirk to Formentera, one of the Balearic Islands. Similar measurements having been made in Britain, the length of a total arc of twenty degrees has been found. Many measurements have also been made elsewhere. The term is also applied to the divisions, spaces, or intervals marked on a mathematical, meteorological, or other instrument, as a thermometer or barometer.

Degree, in universities, a mark of distinction conferred on students, members, or distinguished strangers, as a testimony of their proficiency in the arts or sciences, or as a mark of respect, the former known as ordinary, the latter as honorary degrees. The degrees are bachelor, master, and doctor, and are conferred in arts, science, medicine, divinity, and music.

De Haas, Maurice Frederick Hendrick (1832–97), painter, b. in Rotterdam, Holland. He studied at the Academy of Fine Arts; in 1857 was made artist of the Holland navy, and in 1859 became located in New York City. His best known American work is *Farragut Passing the Forts.* He became an academician of the national academy in 1867, and was one of the original members of the American society of painters in water colors.

De′ism, a philosophical system which, as opposed to *Atheism*, recognizes a great first cause; as opposed to *Pantheism*, a Supreme Being distinct from nature or the universe; while, as opposed to *Theism*, it looks upon God as wholly apart from the concerns of this world. It thus implies a disbelief in revelation, scepticism as regards the value of miraculous evidence, and an assumption that the light of nature and reason are the only guides in doctrine and practise. It is thus a phase of Rationalism. In the last century there were a series of writers who are spoken of distinctively as the English deists. They include Collins, Toland, Tindal, etc.

De Kalb, John (1721–1780), baron, a general in the American army of the Revolution, b. in Alsace. He was a brigadier in the French service, and in 1777 accompanied Lafayette to America. Congress appointed him a major general, and he served in New Jersey and Maryland, was second in command under General Gates, and was mortally wounded at Camden.

De Koven, Reginald, American composer, b. 1859 at Middletown, Conn. He studied at Stuttgart and Paris, and later attended Oxford University, where he graduated in 1879. He devoted himself to composition, and produced several popular operas and songs, among which are *Margery Daw*, *O Promise Me*, *Winter's Lullaby*, and *Ask What Thou Wilt.* His operas are, *Robin Hood*, *Don Quixote*, *The Fencing Master*, *Rob Roy*, and *The Mandarin.* He is at present musical critic of the New York *World.*

Delago′a Bay, in Southeast Africa, a large sheet of water separated from the Indian Ocean by the peninsula and island of Inyack. The bay stretches north and south upward of 40 mi., with a breadth of from 16 to 20 mi., and forms the southern extremity of the Portuguese settlement of Mozambique. It is available for vessels of large tonnage, though the presence of shoals, banks, and flats renders the navigation of the bay somewhat intricate. The port and Portuguese settlement of Lourenço Marques is becoming a place of considerable trade since the opening of gold mines in the Transvaal.

Delagoa Bay.—*Award Paid.* The arbitration in regard to the Delagoa Bay case was closed July 21, 1900, at which time it was announced that the Portuguese government had deposited the amount of the award subject to the order of the American and British claimants. The amount of the award, $3,202,800, was announced from Berne, Switzerland, the meeting place of the tribunal, late in March. This case has been in process of arbitration for nine years. The amount was disappointing to the claimants, especially to the Americans, whose share is a small proportion of the whole. The interest on the amount of the award for eleven years at five per cent makes the total to be paid about $4,250,000. By paying this amount Portugal retains possession of the Lorenço Marques railroad, which is the easiest means of reaching the Transvaal country. This line, which extends from Lorenço Marques to Pretoria, was the cause of the dispute. It seems that an American citizen, in 1883, secured from the Portuguese government a franchise to build a railroad from Lorenço Marques, on Delagoa Bay, to the Transvaal. The line was actually commenced in 1887, the capital being furnished by British and American capitalists. Before the line was completed, the holder of the franchise died, and the line was confiscated by the Portuguese in 1889. The stockholders protested, and the United States and England took the matter up, and Portugal consented to arbitration. Those who were interested in the results expected from $10,000,000 to $15,000,000.

De la Ramee, Louisa, known to the literary world as "Ouida," was b. in England in 1840. Her novels, though full of incident, are disfigured by extravagance of language.

Delaroche (dė-là-rosh), Hippolyte (familiarly styled Paul) (1797–1856), probably the greatest painter of the French school. He studied landscape painting for a short time, but applied himself afterward to historical painting, and rapidly rose to eminence. His subjects are principally taken from French and English history.

Delaware, a river of the U. S. which rises in Catskill Mountains in New York, separates Pennsylvania from New York and New Jersey, and New Jersey from Delaware, and loses itself in Delaware Bay. It has a course of about 300 mi., and is navigable for large vessels to Philadelphia, and for smaller craft to the head of tide water at Trenton (155 mi.).

Delaware, one of the original thirteen states, and, next to Rhode Island, the smallest state in the Union, named after Lord Delaware, one of the early governors of Virginia. It is bounded north by Pennsylvania, east by the Delaware River and Bay and by the ocean, south and west by Maryland; area 2,050 sq. mi. It is divided into three counties, Kent, Newcastle, and Sussex, and has nearly the form of a right-angled triangle (hence its popular name "the diamond state"). Its rivers are small and unimportant, and most of them flow into the Delaware Bay or River. The Delaware and

Chesapeake Canal connects the two great bays, and makes an easy water transit for produce between Philadelphia and Baltimore. Save in a small hilly section in the north, nearly all the surface is low and level, and in the extreme south there is much swampy land; while the most southern two fifths of the area is in great part a sandy region. The hill district in the north presents a stony surface overlying azoic rocks, such as gneiss and granite, with patches of serpentine and limestone. A strip of highly fertile red clay lies south of the hill country; and next southward occurs a productive and fossiliferous greensand formation, succeeded by a somewhat sandy belt, less fertile than the greensand, although the greater part of its extent is by no means unproductive. The coast region has many salt marshes, some of them dyked, and thus rendered tillable; and farther inland is a considerable body of extremely rich alluvial soil. The western border of the state is generally well wooded, and in some places flat and marshy. In the north kaolin and iron ore are found, and bog ore or limonite occurs to some extent in other parts.

Climate.—The climate is mild and healthful except in the southern part, where the swamps occasion some fevers. The range of temperature in winter is from 30 to 38 degrees, and in summer from 69 to 74. The average rainfall is about 49 in.

Vegetation.—Fruit growing is the principal agricultural industry. Great quantities of peaches, apples, and small fruit are raised and sold in Philadelphia and New York. The cereals are wheat, corn, rye, oats, barley, buckwheat, flax, hops, tobacco, peas, beans, clover seed, and flax seed. In the swampy districts there are great forests of cypress and other evergreen trees, and in the semi-tropical regions are large quantities of bog oak, hackmatack, etc.

Manufactures.—In manufacturing Delaware ranks thirty-fifth in the Union. Among the manufactories are cotton, paper, and carriages. Iron shipbuilding is also carried on in the state. There are rolling mills, woolen factories, and flouring mills. There are several railroads, having a total mileage of 350 mi.

Education.—There are two colleges in the state, Delaware College at Newark, and Wesleyan Female College at Wilmington. The public school education is thorough throughout the state. The state provides for the purchase of free text-books. The state institutions are a state hospital for the insane, industrial school for boys and girls, deaf, dumb, and blind institutions, etc.

History.—Delaware was one of the original thirteen states of the Union. It was first settled by Swedes and Finns in 1638; in 1655 it passed into the hands of the Dutch; in 1664 it passed with New York into the hands of the English; in 1682 Wm. Penn became proprietor of the Delaware counties. Delaware was a slave state until the Civil War, but took no part in the secession movement. The principal cities are Wilmington, Dover (the capital), and New Castle. The pop. of the state

in 1900 was 184,735. The popular name is the *Blue Hen State.*

Governors.—Joshua Clayton, 1796-98; Gunning Bedford, 1796-97; Daniel Rogers, 1797-98; Richard Bassett, 1798-1801; James Sykes, 1801-02; David Hall, 1802-05; Nathaniel Mitchell, 1805-08; George Truett, 1808-11; Joseph Haslett, 1811-14; Daniel Rodney, 1814-17; John Clarke, 1817-20; Jacob Stout, 1820-21; John Collins, 1821-22; Caleb Rodney, 1822-23; Joseph Haslett, 1823-24; Samuel Paynter, 1824-27; Charles Polk, 1827-30; David Hazzard, 1830-33; Caleb P. Bennett, 1833-36; Charles Polk, 1836-37; Cornelius P. Comegys, 1837-40; Wm. B. Cooper, 1840-44; Thomas Stockton, 1844-46; Joseph Maul, 1846; Wm. Temple, 1846-47; Wm. Thorp, 1847-51; Wm. H. Ross, 1851-55; Peter F. Cansey, 1855-59; Wm. Burton, 1859-63; Wm. Cannon, 1863-67; Gove Saulsbury, 1867-71; James Ponder, 1871-75; John P. Cochran, 1875-79; John W. Hall, 1879-83; Chas. C. Stockley, 1883-87; Benjamin T. Biggs, 1887-91; R. J. Reynolds, 1891-95; J. H. Marvil (d. April 8), 1895; W. P. Watson, 1895-97; E. W. Tunnell, 1897-1901; John Hunn, 1901

Delaware, Delaware co., O. Railroads: Columbus, Hocking Valley & Toledo, and C. C. C. & St. L. Industries: chair, castiron, furniture factories, woolen mills, and carriage shops. Seat of Ohio Wesleyan University. Pop. 1900, 7,940.

Delaware Bay, an estuary or arm of the sea between the states of Delaware and New Jersey. At the entrance, near Cape Henlopen, is situated the Delaware Breakwater, which affords vessels a shelter within the cape. It was erected by the Federal government, and cost about $3,000,000.

Delaware Indians, a tribe belonging to the Algonquin family, originally known as living on the Delaware River, and called by themselves *Lenni Lenapé.* They had to leave their original settlements about the middle of last century, going farther west, and latterly they were removed to the Indian Territory. Their numbers are now insignificant.

Delft (formerly Delf), a town, Holland, 8 mi. n. w. Rotterdam, intersected in all directions by canals. Among its buildings are the town-hall, the Prinsen-hof, the scene of the assassination of William the Silent, now a military barrack; the old Reformed church, containing the monuments of Admiral Tromp, the naturalist Leeuwenhoek, etc.; the new church, containing monuments to William I, Hugo Grotius, and the burial vaults of the present royal family. Pop. 27, 131.

Delhi (del'i), a city of Hindustan, in the Punjab, anciently capital of the Patan and Mogul empires, about 954 mi. n.w. Calcutta. It was at one time the largest city in Hindustan. A vast tract, covered with the ruins of palaces, pavilions, baths, gardens, mausoleums, etc., marks the extent of the ancient metropolis. The present city abuts on the right bank of the Jumna, and is surrounded on three sides by a lofty stone wall. The palace or residence of the Great Mogul, built by Shah Jehan, commenced in 1631, and now known as "the fort," is situated in the east of the city, and abuts directly on the river. It is surrounded on three sides by an embattled wall of reddish sandstone nearly 60 ft. high, with round towers at intervals, and a gateway on the west and south. Since the mutiny of 1857 a great portion has been demolished in order to make room for military barracks. One of the most remarkable objects in the city is the Jamma Musjid or Great Mosque, a magnificent structure in the Byzantine-Arabic style, built by the Emperor Shah Jehan in the seventeenth century. Among modern buildings are the government college, founded in 1792, the Residency, and a Protestant church. Pop. 193,580.

Delir'ium Tre'mens, an affection of the brain which arises from the inordinate and protracted use of ardent spirits. It is therefore almost peculiar to drunkards. The principal symptoms of this disease, as its name imports, are delirium and trembling. The delirium is a constant symptom, but the tremor is not always present, or, if present, is not always perceptible. Frequently the sufferer thinks he sees the most frightful, grotesque, or extraordinary objects, and may thus be put into a state of extreme terror. It is properly a disease of the nervous system.

Della Robbia, Luca (1400-1482), Italian sculptor. He was distinguished for his work both in marble and bronze, and also for his reliefs in terra-cotta coated with enamel, a kind of work named after him.

Delorme (dė-lorm), Marion, a celebrated French beauty who reigned under Louis XIII. The date of her birth is stated at 1611, 1612, and 1615. Her beauty and wit soon made her house the rendezvous of all that was gallant and brilliant in Paris. She espoused the side of the Frondeurs, and Mazarin was about to have her arrested when her sudden death terminated her short career of thirty-nine years.

De'los, an island of great renown among the ancient Greeks, fabled to be the birthplace of Apollo. It was a center of his worship, and the site of a famous oracle. It is the central and smallest island of the Cyclades, in the Ægean Sea, a rugged mass of granite about 12 sq. mi. in extent.

De Long, George Washington (1844-1881), Arctic explorer; b. in New York City; d. in Siberia, Russia. He was educated in the public schools at Brooklyn. In 1861 he was appointed midshipman at the U. S. Naval Academy, and graduated in 1865. He commanded an exploring expedition to the Arctic regions, which resulted in a number of important discoveries, but which was ill-fated, all but two of the party perishing.

Delphi, an ancient Greek town, originally called Pytho, the seat of the famous oracle of Apollo, was situated in Phocis, on the southern side of Parnassus, about 8 mi. n. of the Corinthian Gulf. It was also one of the meeting-places of the Amphictyonic Council, and near it were held the Pythian games. The oracles were delivered by the mouth of a priestess who was seated on a tripod above a subterranean opening, whence she received the vapors

ascending from beneath, and with them the inspiration of the Delphian god. The oracular replies were always obscure and ambiguous; yet they served, in earlier times, in the hands of the priests, to regulate and uphold the political, civil, and religious relations of Greece. The oracle was celebrated as early as the ninth century B. C., and continued to have importance till long after the Christian era, being at last abolished by the emperor Theodosius.

Delphos, Allen and Van Wert cos., O., on Miami & Erie Canal, 74 mi. s.w. of Toledo. Railroads: P. Ft. W. & C.; T. St. L. & K. C. (clover leaf route); C. H. & D.; and Northern Ohio. Industries: wheel works, two flouring mills, iron foundry, hoop and stave, hinge coupler, gas engine, and patent fence factories, furniture factory and marble works. Oil and natural gas found in paying quantities. Surrounding country agricultural. The town was first settled in 1834. Pop. 1900, 4,517.

Delsarte, FRANÇOIS ALEXANDRE (1811–1871), musician and investigator, b. at Solsme, France. He composed a few melodies and wrote several romances. He was chiefly known as a teacher of singing and declamation. Many operatic and dramatic celebrities owe their success to his training. At the age of twelve he devised an original method of musical notation. Baurbini was so pleased with his originality that he adopted him. Delsarte sought by an elaborate system to reduce human expression to a science. Some charts representing his formulations are extant. His philosophy has become the basis of culture and criticism. According to Delsarte the trinity is the universal formula of human life, arts, and sciences. Each part of man's three-fold nature has a distinct office to perform and yet is inseparably connected with every other part. The vital forces express themselves by tension, or tone used in the medical sense — that is, power or strength; the mental in words, and the emotional by gestures. The limbs are the primary vital organs; the head is the mental organ and the torso the emotional. All vital movements are from the center; all mental movements toward the center; all normal movements are around the center. Bodily motions should be governed by the laws of opposition, succession, rhythm, force, direction, velocity, and reaction. The Delsarte system has been popularized in the U. S., and its fundamental principles applied to health with excellent results. His influence on plastic, decorative, and dramatic arts has been widely felt. He claimed that every outward manifestation is but the expression of an inner state. The following rules have been applied to the improvement of man's physical condition: 1, Relaxing movements relieve nervous strain and conserve vital energy. 2, Energizing movements increase and direct nervous force. 3, Æsthetic movements produce health. harmonious development, and pleasing expression by harmonizing man's three-fold nature.

Delta, the name of the Greek letter Δ, corresponding to the English D. The island formed by the alluvial deposits between the mouths of the Nile, from its resemblance to this letter, was named Delta by the Greeks; and the same name has since been extended to those alluvial tracts at the mouths of great rivers which, like the Nile, empty themselves into the sea by two or more diverging branches.

Demand and Supply, terms used in political economy to express the relations between consumption and production, between the demand of purchasers and the supply of commodities by those who have them to sell. The relations which subsist between the demand for an article and its supply determine its price or exchangeable value. When the demand for a commodity exceeds the supply the price of the commodity is raised, and when the supply exceeds the demand the price falls.

Demavend (de-mä′vend), a volcanic mountain of Persia, and the highest peak of the Elbruz chain, 45 mi. s. of the Caspian Sea and about 40 mi. n.e. of Teheran. Its height is about 19,400 ft., and it bears evidence of having been active during the latest geological (if not within the historic) period.

Dembin′ski, HENRYK (1791–1864), a Polish general, and leader in the Hungarian revolution of 1849. He served under Napoleon during the Russian campaign of 1812; was governor of Warsaw and commander-in-chief of the Polish army during the revolution of 1830; was appointed by Kossuth commander of the Hungarian troops in 1849, and served till Kossuth's resignation compelled him to seek refuge in France, where he remained till his death.

Demera′ra (or Demarara), a division of British Guiana, which derives its name from the river Demerara. It extends about 100 mi. along the coast, lying on the e. of Essequibo and on the w. of Berbice. The soil is very fertile, producing abundant crops of sugar, coffee, cotton, rice, etc. Chief town, Georgetown. Population of province, 125,000. The river, after a course of about 120 mi., flows into the Atlantic.

Deme′ter, one of the twelve principal Grecian deities, the great mother goddess, the nourishing and fertilizing principle of nature.

Demet′rius (or Dmitri), the name of a series of impostors who usurped supreme authority in Russia, and led to some of its remarkable revolutions.

Demi-rilievo (-ri-li-ā′vō), in sculpture, half-relief, or the condition of a figure when it rises from the plane as if it had been cut in two and only one half fixed to the plane.

Dem′iurge, (Greek, *Dēmiourgos*, a handicraftsman), a designation applied by Plato and other philosophers to the Divine Being, considered as the Architect or Creator of the universe.

Democ′racy, the rule of a people by the people themselves; that form of government in which the sovereignty of the state is vested in the people, and exercised by them either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states

of modern times. The term is also applied in a collective sense to the people or populace, especially the populace regarded as rulers.

Democ′ritus (B. C. 470–370), a Greek philosopher of the new Eleatic school, a native of Abdēra. He was called "the laughing philosopher," from his habit of laughing at the follies of mankind. In his system he developed the mechanical or atomical theory of his master, Leucippus. Thus he explained the origin of the world by the eternal motion of infinite number of invisible and indivisible bodies or atoms, which differ from one another in form, position, and arrangement, and which have a primary motion, which brings them into contact, and forms innumerable combinations, the result of which is seen in the productions and phenomena of nature.

De′mon (Greek, *daimon*), a spirit or immaterial being of supernatural but limited powers, especially an evil or malignant spirit. Among the ancient Greeks the name was given to beings similar to those spiritual existences called angels in the Bible. In the New Testament evil spirits are called demons (commonly translated "devils"). A belief in demons is found in the oldest religions of the East.

Demonstration, in a logical sense, any mode of connecting a conclusion with its premises, or an effect with its cause. In a more rigorous sense it is applied only to those modes of proof in which the conclusion necessarily follows from the premises. In ordinary language, however, demonstration is often used as synonymous with *proof*.

Demosthenes (-nēz) (B.C. 384–322), the famous ancient Greek orator, was the son of a sword-cutler at Athens. His father left him a considerable fortune, of which his guardians attempted to defraud him. Demosthenes, at the age of seventeen years, conducted a suit against them himself, and gained his cause. He then set himself to study eloquence, and though his lungs were weak, his articulation defective, and his gestures awkward, by perseverance he at length surpassed all other orators in power and grace. He thundered against Philip of Macedon in his orations known as the *Philippics*, and endeavored to instill into his fellow citizens the hatred which animated his own bosom. He labored to get all the Greeks to combine against the encroachments of Philip, but their want of patriotism and Macedonian gold frustrated his efforts. He was present at the battle of Chæroneia (380 B.C.), in which the Athenians and Bœotians were defeated by Philip, and Greek liberty crushed. On the accession of Alexander in 336 Demosthenes tried to stir up a general rising against the Macedonians, but Alexander at once adopted measures of extreme severity, and Athens sued for mercy. It was with difficulty that Demosthenes escaped being delivered up to the conqueror. In 324 he was imprisoned on a false charge of having received a bribe from one of Alexander's generals, but managed to escape into exile. On the death of Alexander next year he was recalled, but the defeat of the

Greeks by Antipater caused him to seek refuge in the temple of Poseidon, in the island of Calauria, on the coast of Greece, where he poisoned himself to escape from the emissaries of Antipater. The character of Demosthenes is by most modern scholars considered almost spotless. His fame as an orator is equal to that of Homer as a poet. Cicero pronounces him to be the most perfect of all orators. He carried Greek prose to a degree of perfection which it never before had reached. Everything in his speeches is natural, vigorous, concise, symmetrical. We have under his name sixty-one orations, some of which are not genuine. The great opponent—and indeed enemy—of Demosthenes as an orator was Æschines.

Demurr′age, in maritime law, the time during which a vessel is detained by the freighter, beyond that originally stipulated, in loading or unloading. When a vessel is thus detained she is said to be *on demurrage*. The name is also given to the compensation which the freighter has to pay for such delay or detention. Demurrage must be paid though it be proved the delay is inevitable; but it cannot be claimed where it arises from detention by an enemy, tempestuous weather, or through the fault of the owner, captain, or crew.

Demurrer, in law, a stop at some point in the pleadings, and a resting of the decision of the cause on that point; an issue on matter of law. A demurrer confesses the fact or facts to be true, but denies the sufficiency of the facts in point of law to support the claim or defense.

Dena′rius, a Roman silver coin worth 10 asses or 10 lbs. of copper originally, and afterward considered equal to 16 asses, when the weight of the as was reduced to an ounce on account of the scarcity of silver. The *denarius* was equivalent to about 16 cents of our money. There was also a gold denarius equal in value to 25 silver ones.

Denbigh (den′bi), a county of North Wales, on the Irish Sea; area, 662 sq. mi., of which about a fourth is arable. There are several beautiful and fertile vales, among the more celebrated of which are the vales of Llangollen, Clwyd, and Conway. Pop. 117,872; capital, Denbigh; pop. 4,507.

Denis, St., a town in France, department of the Seine, 6 mi. n. of Paris. It contains the famous abbey church of St. Denis, a noble Gothic structure in part dating from the eleventh century or earlier, but much has been done in the way of restoration in the present century. St. Denis was the burial place of the kings of France; and all her rulers from Hugh Capet downward, besides some of the earlier dynasties, lay there till 1793, when the revolutionary fury of the convention caused the tombs to be rifled and the church to be denuded.

Denison, Grayson co., Texas. Railroads: M. K. & T.; H. & T. C.; and Texas Pacific. Industries: machine shop, wagon works, planing and grist mills, and bridge works. Coal and iron are within easy reach. The town was

first settled in 1872 and became a city in 1873. Pop. 1900, 11,807.

Den'mark, a northern kingdom of Europe, consisting of a peninsular portion called Jutland, and an extensive archipelago lying east of it and comprising the islands of Seeland, Fünen, Laaland, Falster, Langeland, Möen, Samsö, Lasö, Arrö, Bornholm, and many smaller ones. Besides these there are the outlying possessions of Iceland, Greenland, and the Faroe Islands in the Atlantic Ocean, and Santa Cruz, St. Thomas, and St. John in the West Indies. The area of the home possessions is 15,288 sq. mi., of which Jutland occupies 9,743; pop. 2,185,162. Copenhagen is the capital; other chief towns are Odense, Aarhuus, Aalborg, Randers, and Horsens. Denmark is divided into eighteen provinces or districts, besides the capital, nine of these making up Jutland, while the others embrace the islands. Denmark, whether insular or mainland, is a very low-lying country, the eastern side of Jutland, where the highest elevation occurs, not exceeding 550 ft. All the rocks belong to the upper series of the secondary and to the tertiary formation. The rock most fully developed is the chalk, above which is an extensive boulder formation containing seams of lignite. Above this are thick beds of clay and marl. Where this prevails, as in Seeland and the east of Jutland, the soil is generally fertile; but where it is overlaid with deep beds of sand, as in the north and west of Jutland, the aspect is extremely desolate. Nearly the whole west coast, indeed, is rendered almost uninhabitable by the drift sand, which has formed an almost uninterrupted line of sterile downs called *Klitten*, extending from Cape Skagen (or The Skaw) to Blaavands Hook. A large portion of Jutland consists of heathy or moory land, comparatively unprofitable. Elsewhere it exhibits a fertile, undulating surface. The islands, especially Seeland and Funen, are fertile and present many landscape beauties. Woods of some extent exist, especially in the islands. In earliest prehistoric times the Scotch fir was the prevailing tree, and subsequently the oak. The principal tree now is the beech. The elm, ash, willow, aspen, and birch are met with in small numbers. Pine forests have been planted in the north of Jutland and elsewhere. Denmark has numerous streams but no large rivers; the principal is the Guden, which flows northeast through Jutland into the Cattegat. It is navigable for part of its course. The lakes are very numerous but not large, none exceeding 5½ mi. in length by about 1½ mi. broad. There are numerous winding inlets of the sea that penetrate far into the land. The largest of these, the Liimford, in Jutland, entering from the Cattegat by a narrow channel, winds its way through to the North Sea, thus making Northern Jutland really an island. Intercourse between the various islands and parts of the kingdom, separated from each other by water, is well kept up by ferries, etc., and the country is well supplied with railways, both in Jutland and the islands. Copenhagen, Aalborg, Aarhuns, and Randers are the chief seaports. Owing to the lowness of the land and its proximity to the sea on all sides, the climate is remarkably temperate for so northerly a region, though the thermometer in winter may sink to 22° below zero, and in summer rise to 89°. Violent winds are frequent, and rains and fogs prevalent. The agricultural land is greatly subdivided, as the law interdicts the union of small farms into larger. Among crops the greatest area is occupied by oats, which are grown all over the country, but best in Jutland. Barley is grown chiefly in Seeland, and is largely used in brewing beer, the common beverage of the country. Rye is extensively raised. Turnips, beans, peas, flax, hemp, hops, tobacco, etc., are also grown; but in general, cattle breeding, grazing, and the dairy take up most of the farmer's attention in Denmark. The old Danish breed of horses found chiefly in Jutland, has long been famous for strength, symmetry, docility, and bottom. The herring, turbot, torsk, and salmon are the most abundant. Paper, gloves, the woolens, and earthenware of Jutland, the wooden clocks of Bornholm, are the chief manufactures. There are also iron foundries, sugar refineries, some extensive tanneries, and many distilleries. The commerce of Denmark is carried on chiefly with Great Britain, Germany, Norway, Sweden, and Russia—Germany possessing the largest share. The value of imports has in recent years varied between $65,000,000 and $80,000,000. The chief imports are textile manufactures, metal goods, coal, timber, oil, coffee, sugar, tobacco, fruit, etc. The chief exports are cattle, horses, and swine, butter (a most important item), bacon, hides, flour, eggs, and other edibles. Much of the butter and other agricultural produce goes to Britain. In 1895 the mercantile marine had a total tonnage of about 330,033 tons. The railways have a length of about 1,407 mi. Since 1875 the unit of the Danish monetary system has been the *krone*, or crown. The krone is divided into 100 *öre*.

The population of Denmark is composed almost exclusively of Danes, with a few thousand Jews and others. The Danes have regular features, fair or brownish hair, and blue eyes. They still maintain their reputation for seafaring skill and hospitable customs. They are almost exclusively Lutherans in religion, but unlimited toleration is extended to all faiths. Jews, however, though themselves electors, cannot be elected as representatives. At the head of the educational institutions stand the University of Copenhagen and the Holberg Academy at Soröe. The provinces are well supplied with gymnasia and middle schools, and primary instruction is given at the public expense in the parochial schools. It is rare to meet a peasant who cannot read and write, even among the poorer class.

The government of Denmark was originally an elective monarchy. In 1661 it became a hereditary and absolute monarchy, and in 1849 a hereditary constitutional one, the legislative power being in the king and diet jointly. The diet or *Rigsdag* consists of two chambers, the *Landsthing* or upper house, the *Folkething* or

lower house. The former is a senate of 66 members, 12 of whom are nominated for life by the crown, the others being elected for 8 years. The members of the Folkething are 102 in number, directly elected by universal suffrage, and hold their seats for 3 years. The Rigsdad meets every October, and all money bills must be submitted to the lower house. The army consists of all the able-bodied young men of the kingdom who have arrived at the age of twenty-one years. The time of service is 8 years in the regular troops, and afterward 8 more in the reserve. Every corps has to drill for 30 to 45 days every year. The army on a war footing has a total strength of 1,352 officers and 45,910 men. The navy consists of 45 vessels and 135 guns. The revenue usually amounts to about $15,000,000. The national debt is $33,004,722.

History.—The oldest inhabitants of Denmark were the Cimbri, who dwelt in the peninsula of Jutland, the *Chersonecus Cimbrica* of the Romans. They first struck terror into the Romans by their incursion, with the Teutons, into the rich provinces of Gaul (113–101 B. C.). After this, led by the mysterious Odin, the Goths broke into Scandinavia, and appointed chiefs from their own nation over Denmark, Norway, and Sweden. For a considerable time Denmark was divided into a number of small states, whose inhabitants lived mostly by piracy along the neighboring coasts. In 787 they began to make their descents on the eastern coasts of England, and along with other inhabitants of Scandinavia they conquered Normandy in 876–77. Under Gorm the Old all the small Danish states were united in 920, and his grandson Sweyn, now the head of a powerful kingdom, commenced the conquest of Norway and of England, which was ultimately completed by his son Canute. Canute d. in 1035, leaving a powerful kingdom to his successor, who, in 1042 lost England, and in 1047 Norway. In 1047 Sweyn Magnus Estridsen ascended the throne, but with the exception of the great Waldemar the new dynasty furnished no worthy ruler, and the power of the kingdom decayed considerably till the accession of the politic Queen Margaret in 1387, who established the union of Calmar in 1397, uniting under her rule Denmark, Sweden, and Norway. Under the rule of Christian, Norway, Sweden, Schleswig, and Holstein were connected with the crown of Denmark, but under his successor Christian II Sweden established its independence. Under Frederick I (1523–33), the reformation was introduced. Christian IV of Denmark ascended the throne in 1588, took part in the Thirty Years' War, and engaged twice in a war with Sweden, with most unfortunate results. Frederick III again engaging in war with Sweden in 1657 was equally unsuccessful. Christian V and Frederick IV were conquered in the war with Charles XII. Denmark, however, after the fall of Charles XII, gained by the peace of 1720 the toll on the Sound, and maintained possession of Schleswig. After this Denmark enjoyed a long repose. In 1800, having acceded to the northern confederacy, the kingdom was involved in a war with Great Britain, in which the Danish fleet was defeated at Copenhagen, April 2, 1801. In 1807, there being reason to think that Denmark would join the alliance with France, a British fleet was sent up the Sound to demand a defensive alliance or the surrender of the Danish fleet as a pledge of neutrality. Both were denied, till the Danish capital was bombarded and forced to capitulate, the whole fleet being delivered up to the British. The war, however, was continued, Denmark forming new alliances with Napoleon till 1814, when a peace was concluded by which she ceded Heligoland to England in exchange for the Danish West India Islands, and Norway to Sweden in exchange for Swedish Pomerania and Rügen, which, however, she shortly after surrendered to Prussia, receiving in return Lauenburg and a pecuniary compensation. In June, 1815, the king entered into the German confederacy, as representing Holstein and Lauenburg. In 1848 Schleswig and Holstein revolted and were not finally subdued till 1852. In 1857 the Sound dues were abolished. Frederick VII d. in 1863 and with him the Oldenburg line became extinct. He was succeeded by Christian XI. At the commencement of 1864 the Danish territory was politically distributed into four parts; viz., Denmark Proper, the duchy of Schleswig, or South Jutland, the duchy of Holstein, the duchy of Lauenburg. The measures of the Danish government compelling the use of the Danish language in state schools having given great umbrage to the German population of the duchies, the disputes resulted in the intervention of the German confederation, and ultimately Holstein was occupied by the troops of Austria and Prussia (1864). After a short campaign the Prussians captured Alsen, overran the greater part of Jutland, and forced the Danes to accept a peace (August 1), by which they renounced their right to the duchies of Schleswig, Holstein, and Lauenburg. A difference now arose between Austria and Prussia as to what should be done with the duchies, and Prussia showing an evident intention of annexing them, the result was a war between the two powers, which ended in the total defeat of Austria at Sadowa, or Königgrätz, July 3, 1866. By the treaty which followed Austria relinquished all claim to the duchies, which thus fell to Prussia.

Language and Literature.—The Danish language belongs to the Scandinavian branch of the Teutonic family of languages, and is a sister of the Swedish and Norwegian. It is the most modern of the Scandinavian tongues; soft and rather monotonous, with shades of sound difficult for a foreigner to acquire. It is written either in the German or the Roman character. From the long union of Norway with Denmark, Danish became the written language of the Norwegians, and is still the language of the educated classes. The oldest literary monuments of the Danish language consist of the laws of the early kings in the twelfth century. During the Reformation period Christian Pedersen (1480–1554) did for the Danish language

much what Luther did for the German, by publishing, besides other works, a translation of the New Testament and the Psalter and latterly the complete Bible. Modern Danish poetry commences in the period succeeding the Reformation with hymns, Scriptural dramas, edifying narratives, etc. Justesen Raach and Erik Pontoppidan the elder are among the chief names in this department. Anders Bording (d. 1677) and Thomas Kingo (d. 1723) made names as lyric poets, the sacred poems of the latter being a noble contribution to Danish literature. A new epoch began with Louis Holberg (1684–1754), who was the founder of the Danish stage, and his name and that of the lyric and dramatic poet Ewald mark the brightest period of the national literature. Among the comic dramatists Peder Andres Heiberg, and among song writers the celebrated Jens Baggesen, hold the first place. Fresh life was inspired into Danish poetry by Adam Oehlenschläger (1779–1850), contemporary with whom was Adolf Wilhelm Schack Staffeldt (1770–1826), a lyric poet of the first rank. In 1811 Bernhard Severin Ingemann made his appearance, first as a lyric poet, but afterward turning his attention to the drama, and later to the historic romance.

Den'sity, in physics, the quantity of matter contained in a body under a given bulk. If a body of equal bulk with another contains double the quantity of matter it is of double the density. Or if a body contain the same quantity of matter as another, but under a less bulk, its density is greater in proportion as its bulk is less than that of the other. Hence the density is directly proportional to the quantity of matter, and inversely proportional to the bulk or magnitude. The relative quantities of matter in bodies are known by their gravity or weight, and when a body, mass, or quantity of matter is spoken of, its weight or gravity is always understood, that being the proper measure of the density or quantity of matter. The weights of different bodies, of equal bulks, indicate their relative densities. The density of solids, fluids, and gases, as compared with that of water, is their *Specific Gravity.*

Denta'ria, coral-root, a genus of plants, natural order Cruciferæ. There are about twenty species, natives of temperate countries. They are ornamental herbs, with creeping, singularly-toothed root-stocks, from which they receive the names of coral-root and tooth-wort. The stem leaves are opposite or in whorls of three, and the flowers are large and purple.

Denta'tus, Manius Curius, an ancient Roman general of Sabine descent. In B. C. 290 he brought to a victorious termination the war with the Samnites, which had lasted for nearly fifty years. In B. C. 275 he defeated King Pyrrhus at Beneventum, for which he received a magnificent triumph. In B. C. 274 he was made consul for the third time and conducted to a successful issue the last war with the southern Italians. He died about B. C. 270.

Den'tils, in architecture, the little cubes resembling teeth, into which the square member in the bed-molding of an Ionic, Corinthian, or Composite cornice is divided.

Den'tine, the ivory tissue lying below the enamel and constituting the body of a tooth. It consists of an organic basis disposed in the form of extremely minute tubes and cells, and of earthy particles.

Den'tistry, the art of cleaning, extracting, repairing, and replacing teeth. There are two very distinct departments in dentistry, the one being *dental surgery*, the other what is known as *mechanical dentistry*. The first requires an extended medical knowledge on the part of the practitioner, as, for instance, a knowledge of diseases whose effects may reach the teeth, of the connection between the welfare of the teeth and the general system, etc., as well as ability to discern latent oral diseases, calculate the effects of operations, etc. The chief operations in this department are *scaling*, or removing the tartar which has accumulated on the base of the teeth; *regulating*, the restoring of overcrowded and displaced teeth to their proper position; *stopping* or *stuffing*, the filling up of the hollow of a decayed tooth and thus preventing the progress of decay; *extracting*, a process requiring considerable muscular power and delicacy of manipulation. The second department, mechanical dentistry, is concerned with the construction of artificial substitutes for lost teeth, and requires much mechanical science, it being a very delicate work to give artificial teeth a perfectly natural appearance in shape and color. The actual construction of the teeth, however, has passed largely into the hands of the manufacturers, and the dentist has only the selecting, fitting, and fixing to do. In the U. S. the Baltimore College of Dental Surgery is the oldest, being chartered in 1839; the Ohio College of Dental Surgery followed in 1845; the Philadelphia College of Surgery in 1850; the Philadelphia Dental College in 1863; the New York College of Dentistry in 1865, and various others. *The American Journal and Library of Dental Science* was established in Baltimore in 1839. Every state has now its state dental society; besides national organizations, of which the American Dental Association is among the most important.

Denver, a city, capital of the state of Colorado, named after General Denver, on the right bank of the South Platte River, 15 mi. e. of the Rocky Mountains. It is well built, having imposing public and other buildings, and is increasing with extraordinary rapidity, being the junction of eight important railway systems, and having various flourishing industries. The climate is peculiarly dry and salubrious. Founded in 1858. Pop. 1900, 133,859.

Deodoriz'ers, chemical substances which have the power of destroying fetid effluvia, as chlorine, chloride of lime, etc.

D'Eon de Beaumont (dā-on dė bō-mōn), Charles Genevieve Louise Auguste Andre Timothee (1728–1810), a notorious French character, chevalier, doctor of law, diplomatist, etc. In 1755 he was sent as envoy on a difficult mis-

sion to the Russian court, on which occasion he seems to have dressed himself as a woman. He afterward distinguished himself in the Seven Years' War, then went to London as secretary of the French legation, and ultimately became minister plenipotentiary. Having quarreled with the French government, he lived fourteen years in London in a kind of banishment. During these years he had occasionally, probably for purposes of intrigue, dressed and passed as a female, and about this time his sex began to be doubted. In 1777 he returned to France, was ordered to dress as a woman, and continued to do so both there and after he returned to England (in 1785), where he died in great poverty, being then regarded by every one as a female.

Depart'ment, the name given to the principal territorial divisions of France. At the time of the French Revolution departments replaced the old division into provinces, the change being voted in the Constituent Assembly in 1789. There are at present eighty-seven departments, each of which is subdivided into arrondissements.

De Pauw University, at Greencastle, Putnam co., Ind., one of the chief institutions of learning maintained by the Methodist Church, constituted in 1837. It is excellently endowed, mainly by the liberality of the Hon. W. C. de Pauw, has a staff of 35 professors and teachers, and over 600 students.

Depo'nent, 1, in grammar, a verb passive in form, but active or neuter in signification. 2, In law, a person who makes an affidavit, or one who gives his testimony in a court of justice; a witness upon oath.

Dept'ford (det'ford), a parliamentary borough, England, in the counties of Kent and Surrey, on the right bank of the Thames, forming now part of London. It has some manufactures of pottery, chemicals, soap, etc. The old naval dockyard was shut up in 1869, but the royal victualling yard is still the largest establishment of its kind. Pop. 101,326.

Depew, Chauncey Mitchell, orator and lawyer, b. in Peekskill, N. Y., April 23, 1834. He graduated at Yale in 1856. In 1861–62 he was a member of the New York Assembly. In 1863 he was elected secretary of state. In 1866 he became attorney for the Harlem Railroad Company, and, in 1869, became counsel for the consolidated New York Central & Hudson River Railroad Company. In 1874 the legislature appointed him regent of the state university. In 1882 he became second vice-president of the New York Central & Hudson River Railroad Company, and in June, 1885, was elected to the presidency. He was also made president of the West Shore Railroad Company. He retired from the presidency of these roads in 1898 and was elected United States senator from New York in January, 1899.

De Quincey, Thomas (1785–1859), a well-known English author, was the son of a Manchester merchant, and b. at Greenhays, near Manchester. In 1803 he matriculated at Oxford, and it was in the second year of his course there that he began to take opium in order to alleviate severe neuralgic pains. On leaving college he settled at Grasmere, Westmoreland, in the vicinity of Wordsworth and Southey, and devoted himself to literary work. Here or in London he remained till 1828, reading voraciously, and writing for the *London Magazine, Knight's Quarterly Magazine,* and latterly *Blackwood's Magazine.* From 1828 to 1840 he lived in Edinburgh, then removed with his family to Lasswade, which continued to be his headquarters. He d. at Edinburgh.

Dera Ghazi Khan, a district and town in the Punjab, Hindustan. The former, which is in Derajat division, has an area of 4,517 sq. mi. and a pop. of 363,346. The town has a pop. of 22,309, half Hindus and half Mohammedans. It has extensive manufactures of silk, cotton, and coarse cutlery.

Dera Ismail Khan, a district and a town in Hindustan, in the Punjab, in the division of Derajat. The district lies n. of that of Dera Ghazi Khan on both sides of the Indus, and has an area of 9,296 sq. mi., and a pop. of 441,649. The town is a staple place for cotton goods. Pop. 22,164.

Derajat (-jät'), a division or commissionership of Hindustan, in the Punjab, occupying part of the valley of the Indus, and comprising Dera Ghazi Khan, Dera Ismail Khan, and Bannu; area 17,681 sq. mi. It is well watered and fertile, and contains numerous towns and villages. Pop. 1,137,572, mostly Mohammedans.

Derby, a municipal borough in England, capital of Derbyshire, on the Derwent, 115 mi. n.n.w. London. It has some fine public buildings, among which are the churches of All Saints, St. Alkmund, and St. Werburgh, the county hall, school of art, infirmary, etc. There is also a very handsome free library and museum. The principal manufactures are: silk, cotton, paper, articles in Derbyshire spar, castings, and porcelain, etc. Derby is one of the oldest towns in the kingdom, and is supposed to owe its origin to a Roman station, Derventio, situated at Little Chester, on the opposite side of the river. Pop. 94,146. The county of Derby, or Derbyshire, in the center of the kingdom, area 1,029 sq. mi., five sixths being arable or in permanent pasture. It exhibits much varied and romantic scenery, the southern and eastern parts having a fertile soil, while the northwestern portion is bleak, with a rocky and irregular surface. Oats and turnips are important crops, and dairy-husbandry is carried on to a large extent. Coal is abundant in various parts of the county, iron ore is also plentiful, and lead, gypsum, zinc, fluor-spar, and other minerals are obtained. The manufactures are silk, cotton, and lace, machinery and agricultural implements. Pop. 527,886.

Derby, New Haven co., Conn., at the junction of Housatonic and Naugatuck rivers. Railroad, N. Y. N. H. & H. Industries: desk manufactories, cotton mills, etc. Pop. 1900, 7,930.

Der'rick, a lifting apparatus consisting of a single post or pole, supported by stays and

guys, to which a boom with a pulley or pulleys is attached, used in loading and unloading vessels, etc. Floating derricks of the strongest construction, with an immense boom and numerous blocks, are also used.

Derrick-crane, a kind of crane combining the advantages of the common derrick and those of the ordinary crane. The jib of this crane is fitted with a joint at the foot, and has a chain instead of a tension-bar attached to it at the top, so that the inclination, and consequently the sweep, of the crane can be altered at pleasure.

Der′vish (or Dervise; Persian, "poor"), a Mohammedan devotee, distinguished by austerity of life and the observance of strict forms. There are many different orders of them. Some live in monasteries, others lead an itinerant life, others devote themselves to menial or arduous occupations. They are respected by the common people, and the mendicants among them carry a wooden bowl into which the pious cast alms. One of their forms of devotion is dancing or whirling about, another is shouting or howling, uttering the name *Allah*, accompanied by violent motions of the body, till they work themselves into a frenzy and sometimes fall down foaming at the mouth. They are credited with miraculous powers, and are consulted for the interpretation of dreams and the cure of diseases.

Desault (dē-sō), Pierre Joseph (1744–1795), one of the most celebrated surgeons of France. He became principal surgeon in the hospital De la Charité, and in 1788 was put at the head of the great Hôtel Dieu in Paris. Here he founded a surgical school, in which many of the most eminent surgeons of Europe were educated.

Des′cant, in music, an addition of a part or parts to a subject or melody, a branch of musical composition which preceded the more modern counterpoint and harmony, coming into existence at the end of the eleventh or beginning of the twelfth century.

Descartes (dā-kärt), Rene (1596–1650), a great French philosopher and mathematican, with whom the modern or new philosophy is often considered as commencing. He was educated at the Jesuit College of La Flèche, where he showed great talent. He entered the military profession and served in Holland and in Bavaria. In 1621 he left the army, and after a variety of travels finally settled in Holland, and devoted himself to philosophical inquiries. Descartes, seeing the errors and inconsistencies in which other philosophers had involved themselves, determined to build up a system anew for himself. He also contributed greatly to the advancement of mathematics and physics. The higher departments of geometry were greatly extended by him. His system of the universe attracted great attention in his time, though long since exploded. It rested on the hypothesis of celestial *vortices*, immense currents of ethereal matter, by which he accounted for the motion of the planets. His works effected a great revolution in the principles and methods of philosophizing.

Descent′, in law, is the transmission of the right and title to lands to the heir, on the decease of the proprietor, by the mere operation of law. The rule determining to whom an estate belongs, on the decease of the proprietor, is that of consanguinity, or relationship by blood, though with some exceptions, as in the case of the portion, or the use of a portion, of a man's property given by the law to his widow. In the U. S. the laws are founded upon the principle of equal distribution both of real and personal estate among heirs of the nearest surviving degree. Kindred in blood are divided into three general classes, viz., 1, descendants; 2, ancestors; 3, collateral relatives, that is, those who have descended from the same common ancestor. The civil law computes the degrees by counting the generations up to the common ancestor, as father, grandfather, great-grandfather; or mother, grandmother, great-grandmother; and from him or her down to the collateral relative, as brother, cousin, etc., making the degree of relationship the sum of these two series of generations. Every person has two sets of ancestors, the paternal and maternal, and therefore two sets of collateral relatives. There is also a distinction of collateral kindred, into those of the whole blood and those of the half blood.

Desiccation, a process of dispelling moisture by the use of air, heat, or chemical agents such as chloride of calcium, quick-lime, oil of vitriol, and fused carbonate of potash. *Desiccation cracks*, in geology, are the fissures caused in clayey beds by the sun's heat, and seen in various rock strata.

De Smet, Peter John (1801–1872), missionary, b. in Termonde, Belgium; d. in St. Louis, Mo. In 1821 he sailed from Amsterdam in company of Bishop Verinx. In 1828 he went to St. Louis and assisted in establishing the University of St. Louis, and in 1838 was sent to establish a mission among the Pottawatomies. On April 30, 1840, he attached himself to the yearly caravan of the American Fur Company to proceed as missionary among the Flat Head Indians of the Rocky Mountains. In 1841 he returned to St. Louis, but soon set out anew for Indian conversions. On different occasions he efficiently interceded to prevent strife between the U. S. and the Indians; he was also instrumental in ending the Sioux War.

Des Moines, Polk co., Iowa, on Des Moines and Raccoon rivers. It has 17 diverging lines of railroad. Industries: starch factory, flour mill, woolen mill, six iron foundries, and a large number of other factories. Polk county is underlaid by 500,000,000 tons of coal. Two libraries, 9 colleges, 65 churches, and 4 daily newspapers. The town became a city in 1846. Pop. 1900, 62,139.

Des Moines, the largest river in the state of Iowa, rises in the s.w. of Minnesota and flows in a s.e. direction till it falls into the Mississippi about 4 mi. below Keokuk, after a course of 300 mi.

Desmoulins (dā-mö-lan), Benoit Camille (1760–1794), was conspicuous during the first period of the French Revolution. He was

among the most notable of the pamphleteers and orators who urged the multitude forward in the path of revolution.

Desna, a river in Russia, which rises in the government of, and about 50 mi. e. of the town of Smolensk, flows through the governments of Orel and Tchernigov till it joins the Dnieper near Kiev. It is 500 mi. in length and navigable nearly throughout.

De Soto, FERNANDO (1496–1542), a Spanish explorer and discoverer of the Mississippi. He accompanied expeditions to the New World under Davila and Pizarro, and played a distinguished part in the conquest of Peru. In 1539 he led an expedition to Florida, whence after many difficulties he penetrated to the Mississippi, where he was attacked with fever and died. The name De Soto has been given to a county in the n.w. of Mississippi, and to several places in the U. S.

Dessalines (dā-sȧ-lēn), JEAN JACQUES (1760–1806), Emperor of Hayti, b. in Africa. His talents for war, his courage, and unscrupulous conduct raised him to command in the insurrections of the colored people, and after the deportation of Toussaint-L'Ouverture, and the subsequent evacuation of the island by the French, Dessalines was appointed governor general for life with absolute power; and the year following (1804) was declared emperor with the title of Jacques I. He was slain by one of his soldiers.

Dessau (des'ou), a town in Germany, capital of the duchy of Anhalt, in a beautiful valley on the left bank of the Mulde, mostly well built, with fine squares and many handsome buildings. The manufactures consist of woolens, woolen yarn, carpets, machinery, tobacco, etc. The ducal palace has a picture gallery and interesting relics and antiquities. Pop. 27,766.

Deter'minism, a philosophical theory which holds that the will is not free, but is invincibly determined either—according to the older form of the theory—by a motive furnished by Providence, or—according to the modern form —by the aggregation of inherited qualities and tendencies.

Detroit, Wayne co., Mich., on Detroit river. Railroads: Michigan Central; Wabash; L. S. & M. S. It is one of the most important of the lake ports. Its marine traffic amounted in 1895 to $29,000,000. It has many manufacturing industries, there being about 1750 separate establishments employing nearly 40,000 persons. Among them are sawmills, flour mills, ship yards, foundries, tanneries, blast furnaces, tobacco and cigar manufactories, and locomotive car works. There are also extensive pharmaceutical establishments. Detroit has a magnificent system of parks and boulevards and is noted as one of the best drained cities in the U. S. It was settled by the French in 1701. Pop. 1900, 285,704.

Detroit River, or Strait of St. Clair, a river or strait of North America, which runs from Lake St. Clair to Lake Erie. It is 28 mi. long, and of sufficient depth for the navigation of large vessels. It is about ¾ mi. wide opposite Detroit and enlarges as it descends.

Devens, CHARLES, soldier, b. in Charleston, Mass., April 4, 1820; graduated at Harvard in 1838; and became a lawyer. He served in the Civil War, and was brevetted major general after the capture of Richmond. In 1867 he became a superior court justice in Mass., and in 1873 justice of the state supreme court. In 1877 he became attorney general of the U. S., and in 1881 one of the supreme court justices of Mass. Died 1891.

Dev'enter, an old town in Holland, prov. of Overijssel, 8 mi. north from Zutphen, at the confluence of the Schipbeek and Ijssel. Its industries embrace carpets, cast-iron goods, printed cottons, hosiery, and a kind of cake called Deventer cakes. It has a large export trade in butter. Pop. 22,700.

Deviation of the Compass, the deviation of a ship's compass from the true magnetic meridian, caused by the near presence of iron. In iron ships the amount of deviation depends upon the direction, with regard to the magnetic meridian, in which the ship lay when being built. It is least when the ship has been built with her head south. Armor-plated ships should be plated with their head in a different direction from that in which they lay when built. The mode now generally employed to correct deviation is by introducing on board ship masses of iron and magnets to exactly neutralize the action of the ship's magnetism. Compasses are sometimes carried on masts in iron vessels as a means of removing them from the disturbing influence of the iron of the hull. In this position they serve as standards of comparison for the binnacle compass. Wooden ships are also affected, though in a far less degree, by the direction in which they lie when building.

Devil, in theology, an evil spirit or being; specifically the evil one, represented in Scripture as the traducer, father of lies, etc. Most of the old religions of the East acknowledge a host of devils. The doctrine of Zoroaster, who adopted an evil principle called Ahriman, opposed to the good principle and served by several orders of inferior spirits, spread the belief in such spirits among the people. The Greek mythology did not distinguish with the same precision between good and bad spirits. With the Mohammedans *Eblis*, or the devil, was an archangel whom God employed to destroy a pre-Adamite race of *jinns*, or genii, and who was so filled with pride at his victory that he refused to obey God. The Satan of the New Testament is also a rebel against God. He uses his intellect to entangle men in sin and to obtain power over them. But he is not an independent self-existent principle like the evil principle of Zoroaster, but a creature subject to omnipotent control. The doctrine of Scripture on this subject soon became blended with numerous fictions of human imagination, with the various superstitions of different countries, and the mythology of the pagans. The excited imaginations of hermits in their lonely retreats, sunk as they were in ignorance

and unable to account for natural appearances, frequently led them to suppose Satan visibly present; and innumerable stories were told of his appearance, and his attributes — the horns, the tail, cloven foot, etc.— distinctly described. In consequence of the cures which Christ and his apostles performed on the possessed, the early church believed in a power connected with the consecration of priests to drive out evil spirits. The belief in evil spirits, witches, etc., was in the seventeenth century so common that they became the objects of judicial process. With the progress of the natural sciences, however, in the eighteenth century many wonderful phenomena became explained, and less was heard of witchcraft.

Devil, the machine through which cotton or wool is first passed to prepare it for the carding-machines; a teasing-machine.

Devil-fish, the popular name of various fishes, one of them being the angler. Among others the name is given to several large species of ray occasionally captured on the Atlantic and Pacific coasts, and much dreaded by divers, whom they are said to devour after enveloping them in their vast wings. During gales of wind or from strong currents these immense fish are driven into shoal water, and being unable to extricate themselves, fall an easy prey to the vigilance of the fishermen, who obtain considerable quantities of oil from their livers.

Devil Plant, a most deadly plant found in the neighborhood of Philadelphia. It has a pleasant appearance, being of a tender green, clinging close to the earth, and sprinkled with small red blossoms, cup-shaped, and holding in their hearts a single drop of moisture, which the sun has no power to dispel, and wherein this plant's most blighting influence is said to lie. Bees by the hundred have been found dead in the blossoms, and a botanist who tasted this poison-drop declared that it was of a sickening sweetness, without odor, and like liquid gum. Allowed to dwell on his tongue, it soon began to burn and raise a blister, while the tongue became swollen and very painful. Cattle eating of it die in a few hours in great agony, with a sort of exaggerated tetanus.

Devil's Bridge, a famous bridge in Switzerland, over the Reuss, built of stone from mountain to mountain, 75 ft. in length, on the road over St. Gothard, from Germany to Italy.

Devil-worship, the worship paid to the devil, an evil spirit, a malignant deity, or the personified evil principle in nature, by many of the primitive tribes of Asia, Africa, and America, under the assumption that the good deity does not trouble himself about the world; or that the powers of evil are as mighty as the powers of good, and have in consequence to be bribed and reconciled. There is a sect called devil-worshipers inhabiting Turkish and Russian Armenia, and the valley of the Tigris, who pay respect to the devil, to Christ, and to Allah, or the supreme being, and also worship the sun.

Devon (Devonshire), a maritime county in the s. w. of England. Area 2,586 sq. mi., the county being the third largest of England. Tin, lead, iron, copper, manganese, granite, and the clay used by potters and pipemakers are the chief mineral products. The geological formation of the old red sandstone is so largely developed that the term Devonian has to some extent become its synonym. Agriculture is in a somewhat backward state. The clotted cream and cider of Devonshire are well-known as specimens of the county. Pop. 631,767.

Devo'nian System, in geology, a name originally given to rocks of Devonshire and Cornwall, intermediate between the Silurian and Carboniferous strata, and consisting of sandstones of different colors, calcareous slates and limestones, etc. They are divided into lower, middle, and upper groups, all containing fossils, but the middle most abounding in them, including corals, crinoids, crustaceans, mollusca (especially brachiopods), and cephlaopods. Devonian rocks occupy a large area in Central Europe, as well as in the U. S., Eastern Canada, and Nova Scotia. The term has been often used as equivalent to old red sandstone.

Dev'onport, a port of England. It is the seat of one of the royal dockyards, and an important naval and military station. A bastioned wall and fosse defend the town on the northeast and south sides, while the sea entrance is protected by heavy batteries on Mount Wise. Connected with the dockyards and fortifications are the gun wharf, foundries, machine works, rope walks, storehouses, naval and military barracks, etc. Pop. 54,736.

Dew is a deposition of water from the atmosphere upon the surface of the earth in the form of minute globules. During the day the earth both absorbs and emits heat, but after sunset its supply of warmth is cut off, while it still continues to radiate heat into the surrounding space. Grass, flowers, and foliage being good radiators, lose after sunset the heat which has previously been absorbed by them, without receiving any in return, and their temperature consequently falls considerably below that of the atmosphere. From the proximity of these cold substances the particles of vapor in the adjoining air are condensed and deposited upon their surfaces in the form of dew, or of hoar-frost where the temperature of the earth is below 32°. When the sky is clouded the heat abstracted from the earth's surface by radiation is restored by the clouds, which, being good radiators, send back an equal amount of heat to what they receive; and a balance of temperature being thus maintained between the earth and the surrounding atmosphere, no dew is formed. The deposition of dew is likewise prevented by wind, which carries away the particles of air before the vapor contained in them has been condensed. Horizontal surfaces, and those which are exposed to a wide expanse of sky, receive a greater supply of dew than sheltered or oblique surfaces, where circumstances diminish the amount of radiation. The heavy dews which fall in tropical regions are in the highest degree beneficial to vegetation, which,

but for this supply of moisture, would, in countries where scarcely any rain falls for months, be soon scorched and withered. But after the high temperature of the day the ground radiates under these clear skies with great rapidity, the surface is quickly cooled, and the watery vapor, which, from the great daily evaporation, exists in large quantities in the atmosphere, is deposited abundantly. This deposition is more plentiful also on plants, from their greater radiating power; while on hard, bare ground and stones, where it is less wanted, it is comparatively trifling. In cold climates the earth, being cold and sufficiently moist, requires little dew; accordingly the clouds, which are so common in damp and chilly regions, prevent the radiation of heat; the surface is thus preserved warm, and the deposition of dew is, in a great measure, prevented.

Dewey, GEORGE, Admiral U. S. N., born in Vermont, 1837. He graduated from the U. S. Naval Academy in 1851, and entered the service of the U. S., aboard the frigate "Wabash." He was commissioned lieutenant April 19, 1861, and assigned to the steam sloop "Mississippi," under Farragut. He took part in forcing the defenses of New Orleans, and later lost his vessel by running her aground in a fog. In 1870 he was put in command of the "Narragansett" and made surveys on the Pacific coast for six years. In 1882 he was put in command of the "Juniata," on the Atlantic station. He next commanded the "Dolphin," and later still the "Pensacola," and in 1889 was promoted to the rank of commodore. In 1893 he became a member of the lighthouse board, and in 1896 president of the board of inspection and survey, remaining in this position till January, 1898, when he was placed in command of the Asiatic squadron. He won the battle of Manila Bay May 1, 1898, and was made a rear-admiral and given the thanks of Congress. In March, 1899, he became admiral of the navy by act of Congress. He returned to the U. S. in Sept., 1899, and received an unprecedented popular welcome. Money was raised by popular subscription and a house in Washington was bought for him. Later he married Mrs. Hazen, widow of Gen. W. B. Hazen. In 1900 he announced himself a candidate for president,

De Witt, JAN (1625–1672), Grand-pensionary of Holland, celebrated as a statesman and for his tragical end; was the son of Jacob De Witt, burgomaster of Dort. In 1665 the war with England was renewed and conducted by De Witt with great ability till its termination in 1665. In 1672 Louis XIV invaded the Spanish Netherlands and involved Holland in war. De Witt's popularity, already on the decline, suffered still further in the troubles thus occasioned, and he felt it necessary to resign his office of grand-pensionary. He was murdered in 1672.

Dex'trine, the soluble or gummy matter into which starch can be converted by the action of dilute acids or malt extract, or by heat. It is remarkable for the extent to which it turns the plane of polarization to the right hand, whence its name. Its composition is the same as that of starch. By the action of hot dilute acid, dextrine is finally converted into grape sugar. It is white, insipid, and without smell. It is a good substitute for gum-arabic in medicine.

Dextro-compounds, bodies which cause the plane of a ray of polarized light to rotate to the right. Dextrine itself, dextro-glucose, tartaric acid, malic acid, cinchoine, and many other bodies have this property; while others, which have the opposite effect, of causing the plane to rotate to the left, are called *lævo-compounds.*

Dhárwár, the chief town of Dharwar district, in the Bombay presidency, Hindustan, a straggling place with some trade. There is a fort well planned and strongly situated, but now falling into ruins, and military cantonments at 2 mi. distance. Pop. 27,191. The Dharwar district has an area of 4,535 sq. mi.; pop. 882,907.

Dhawala'giri (or Dhaulágiri), one of the highest peaks of the Himalayas, in Nepál; height, 26,826 ft.

Dholpur, native state of Central India, Rajputána; area 1,200 sq. mi.; pop. 249,657.

Diag'onal Scale, a scale which consists of a set of parallel lines drawn on a ruler, with lines crossing them at right angles and at equal distances. One of these equal divisions, namely, that at the extremity of the ruler, is subdivided into a number of equal parts, and lines are drawn through the points of division obliquely across the parallels. With the help of the compasses such a scale facilitates the laying down of lines of any required length to the 200th part of an inch.

Diag'oras, ancient Greek poet and philosopher, flourished about 425 B. C. He spent a great part of his life in Athens. He attacked the prevailing polytheism, and sought to substitute the active powers of nature for the divinities of the Greeks. On this account he had to leave Athens.

Dial (or sundial), an instrument for showing the hour of the day from the shadow thrown while the sun is shining by a *stile* or *gnomon* upon a graduated surface. This instrument has been known from the earliest times among Egyptians, Chaldeans, and Hebrews. From those eastern nations it came to the Greeks. It was introduced into Rome during the first Punic War. Dials are of various construction, horizontal, inclined, or upright, the principle in every case being to show the sun's distance from the meridian by means of the shadow cast by the stile or gnomon. The stile is made parallel with the earth's axis, and may be considered as coinciding with the axis of the diurnal rotation. Consequently, as the sun moves westward the shadow of the stile moves round in the opposite direction, falling on the meridian lines so marked as to represent the hours of the day. The dial, of course, gives solar time, which, except on four days of the year, is slightly different from that of a well-

regulated clock. Dials are now rather articles of curiosity or ornament than of use.

Di'alect, the language of a part of a country, or a distant colony, deviating either in its grammar, vocabulary, or pronunciation, from the language of that part of the common country whose idiom has been adopted as the literary language and the medium of intercourse between well-educated people. Although the use of provincial dialects becomes inconvenient after a language has acquired a fixed literary standard, the study of such dialects is always valuable to the philologist for the light they throw on the history of the language. The diffusion of education and printed books has much relaxed the hold which the provincial dialects of various countries once had on the people, and in general it may be said that the educated classes of any country now speak each of them a uniform language.

Dialec'tics, the old name of logic, or the art of reasoning, but used in Kant's philosophy to mean the logic of appearance, or that logic which treats of inevitable tendencies toward error and illusion in the very nature of reason.

Dial'ysis, the separation of the *crystalloid* constituent elements of a mixture from the *colloid*, the former being bodies which diffuse readily, such as sugar, salt, bichromate of potassium, etc.; the latter bodies which diffuse with difficulty or not at all, bodies resembling glue or gelatin, such as gum, starch, caramel, albumen, the ordinary constituents of food, etc., etc.

Diamagnet'ic, a term applied to substances which, when under the influence of magnetism and freely suspended, take a position at right angles to the magnetic meridian, that is, point east and west. From the experiments of Faraday it appears that all matter is subject to the magnetic force as universally as it is to the gravitating force, arranging itself into two great divisions, the *paramagnetic* and *diamagnetic.* Among the former are iron, nickel, cobalt, platinum, palladium, titanium, and a few other substances; and among the latter are bismuth, antimony, cadmium, copper, gold, lead, mercury, silver, tin, zinc, and most solid, liquid, and gaseous substances. When a paramagnetic substance is suspended freely between the poles of a powerful horseshoe magnet it points in a line from one pole to the other, which Faraday terms the *axial line.* On the other hand, when a diamagnetic substance is suspended in the same manner it is repelled alike by both poles, and assumes an equatorial direction, or a direction at right angles to the axial line.

Diam'eter, the straight line drawn through the center of a circle, and touching the two opposite points of the circumference. It thus divides the circle into two equal parts, and is the greatest chord.

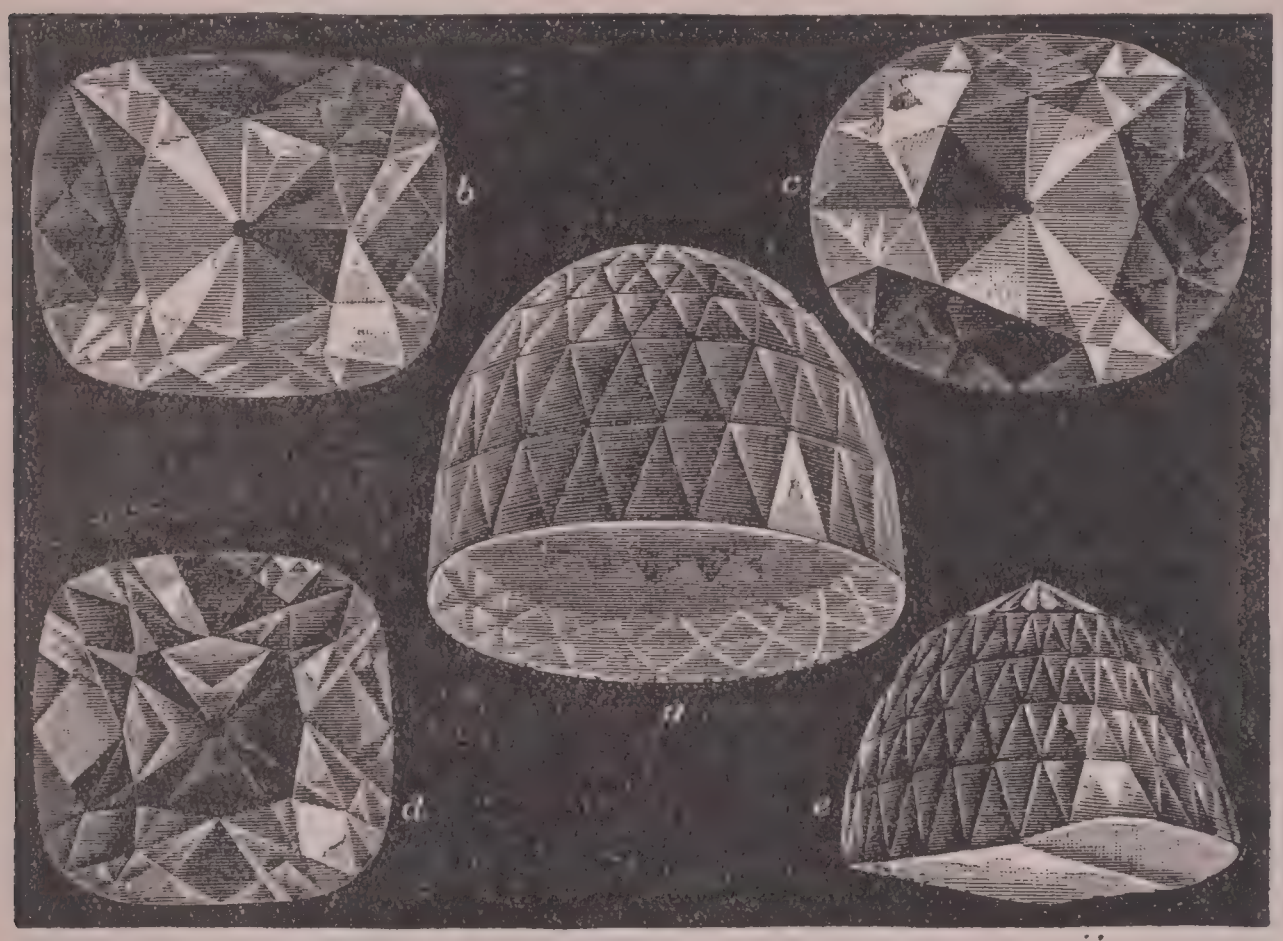
Di'amond, the hardest and one of the most valuable of gems, and the purest form in which the element carbon is found. It crystallizes in forms belonging to the regular or cubic system, the most common being the regular octahedron and rhombic dodecahedron

(twelve faces). The finest diamonds are colorless, perfectly clear, and pellucid. Such are said to be of the finest *water.* But diamonds are often blue, pink, green, or yellow, and such are highly prized if of a decided and equal tint throughout. The hardness of the diamond is such that nothing will scratch it, nor can it be cut but by itself. The value of a diamond is much enhanced by cutting facets upon it inclined at certain angles to each other so as to produce the greatest possible play of color and luster. What is called the *brilliant* cut best brings out the beauty of the stone. Its upper or principal face is octagonal, surrounded by many facets. But this form of cutting requires an originally well-shaped stone. For other diamonds the *rose* cut is used. In this form six triangles are cut on top so that their apices meet in a point called the summit. Round this are disposed other facets. Stones which are too thin to cut as rose-diamond are cut as *table*-diamonds, which have a very slight play of color. The art of cutting and polishing the diamond was unknown in Europe till the fifteenth century, and the stone itself was not nearly so highly valued in the Middle Ages as the ruby.

The uncut diamond looks like a piece of quartz. It is of a dull white color and full of rough seams. In this condition it is set into a matrix of wax which is fastened to the end of a stick. The wax becomes very hard after it is once heated. In another matrix a cheap diamond is set and a workman grinds the two stones together, until the one to be cut has assumed the general form of a brilliant. The dust and chips which come off are carefully collected and used afterward in polishing work. The rough stone is then firmly fixed in a matrix of metal composed of zinc and lead and set into a cup-shaped instrument of iron. The workman is then ready to begin cutting. In this process an iron disk turning at the rate of 2,000 revolutions a minute is used. Upon the disk is sprinkled a supply of diamond dust which sinks into the minute pores of the iron and produces the sharpest grindstone that can be made. The workman, with a magnifying glass close to his eye, grinds first the table or top part of the brilliant. This completed, the metal matrix is melted from the stone which is put in, face downward, so that the exact opposite of the stone will be ground. After this, one by one, the facets or bezils are cut, the first two opposite and parallel, and the second two at right angles to the first two. If the diamond is large the corners remaining between the four opposite cuts are also beveled. Then the stone is turned over in its matrix, and the facets between the girdle and the point known as the *collet* are cut in the same way. Rubies and sapphires are cut by the same general process. Moss-agate, topaz, agate, amethysts and other half-precious stones are first sawed into proper sizes with a soft tin wheel. When the agate, for instance, has been sawed to the proper shape, it is smoothed down on an ordinary grindstone, and then taken in hand by the polisher, who applies it to

a fine grindstone, and, after being ground for about an hour, it is ready for the market.

Diamonds are valuable for many purposes. Their powder is the best for the lapidary, and they are used for jeweling watches, as lenses for miscroscopes, and in the cutting of window and plate glass. When used as a glazier's tool the diamond must be uncut. Inferior kinds of diamonds are also extensively used by engineers in rock boring, and by copperplate engravers as etching points. Diamonds are obtained from alluvial deposits (sands, clays, etc.), being separated by washing. They are found in India, Borneo, and other parts of the East; sometimes in North America and Australia; but the chief diamond fields of to-day are Brazil and Cape Colony, the center of the latter being Kimberley in Griqualand West.



Diamonds.
a.—Great Mogul; *b.*—Star of the South; *c.*—Koh-i-nur; *d.*—Regent; *e.*—Orloff. All actual size.

Diamonds were discovered in the latter only in 1867. One of the largest diamonds known (weight 367 carats) was found in Borneo about a century ago, and belongs to the Rajah of of Mattan. One of the most celebrated is the Koh-i-noor (Mountain of Light), belonging to the British crown. It weighed originally nearly 800 carats, but by subsequent recuttings has been reduced to 103¾ carats. The Orloff diamond, belonging to the Emperor of Russia, weighs 195 carats; the Pitt diamond, among the French crown jewels, 136½. The former, which came from India, has been thought to have originally formed part of the Koh-i-noor stone. Some of the South African diamonds are also very large, one of them (of inferior color) weighing 428 carats. The largest sum actually paid for a precious stone was $625,000, given by the Duke of Orleans for the "Pitt" or "Regent" diamond, the stone being now valued at $2,250,000. Recently, by an expensive process, minute crystals of diamond have been artificially produced.

Dian'a, in mythology, an ancient Italian goddess whom the Romans latterly identified with the Greek Artemis, with whom she had various attributes in common, being the virgin goddess of the moon and of the chase, and having as attributes the crescent moon, bow, arrows, and quiver. She seems to have been originally the patron divinity of the Sabines and Latins. She was worshiped especially by women as presiding over births, no man being allowed to enter her temple.

Diana Monkey, a species of monkey found in Africa, and so named from the crescent-shaped band on the forehead resembling the crescent moon, which was the symbol of Diana.

Dian'dria, the second class in the Linnæan system, comprehending all genera with flowers having only two stamens, provided the stamens are neither united at their base, nor combined with the style and stigma, nor separated from the pistil.

Diaphragm(dī'a-fram), in anatomy, a muscular membrane placed transversely in the trunk, and dividing the chest from the abdominal cavity. In its natural situation the diaphragm is convex on the upper side and concave on its lower, but when the lungs are filled with air it becomes almost flat. It is the principal agent in respiration, particularly in inspiration. A complete diaphragm is found only in Mammalia.

Diarbek'ir, a town, Asiatic Turkey, capital of the pashalic of same name, on a high bank overlooking the Tigris, and surrounded by a lofty massive wall. It has manufactures of iron and copper ware, leather, silk, woolen, and cotton goods, and a considerable trade. Pop. about 40,000.

Di'astase, a substance existing in barley, oats, and potatoes, but only after germination. When in solution it possesses the property of causing fecula or starch to break up at the temperature of 150° F., transforming it first into dextrine and then into sugar. It is obtained by digesting in a mixture of three parts of water and one of alcohol, at a temperature of 113° F., a certain quantity of germinated barley ground and dried in the open air, and

then putting the whole under pressure and filtering it. Diastase is solid, white, and soluble in water and diluted alcohol, but insoluble in strong alcohol.

Diaz, Bartolomeu, a celebrated Portuguese navigator of the fifteenth century, named in 1446 commander of that long succession of exploratory expeditions which the Portuguese court had during this century become distinguished for promoting.

Diaz, Porfirio, Mexican general, b. at Oaxaca, Sept. 15, 1830. In 1867 he marched to Pueblo at the head of a Republican army, and took the city by storm, and afterward aided in the capture of the city of Mexico. He was proclaimed president of Mexico by Congress, serving from 1877 till 1880. During his term the tariff was revised, finances were improved, and important lines of railway established. He was succeeded by Gen. Manuel Gonzalez, and became minister of public works. In 1881 he was made governor of the province of Oaxaca. He was again elected president in 1884, 1888, 1892, 1896, and 1900.

Dice, cubical pieces of bone or ivory, marked with dots on each of their six faces, from one to six, according to the number of faces. They are shaken in a small box and then thrown on the table. Dice are often loaded or falsified in some way so as to make the high or the low sides turn down. Dice are very ancient, being well known among the Egyptians and Greeks.

Dichroite (di'kro-īt), a mineral, a silicate of magnesium, iron, and aluminium, which readily undergoes modifications and passes into other minerals. It exhibits different colors.

Dickens, Charles (1812–1870), one of the greatest English novelists, was b. at Landport, Portsmouth. He received a somewhat scanty education, was for a time a mere drudge in a blacking warehouse, and subsequently a clerk in an attorney's office. Having perfected himself in shorthand, however, he became a newspaper critic and reporter, was engaged on the *Mirror of Parliament* and the *True Sun*, and in 1835 on the *Morning Chronicle.* In 1835 appeared in the *Morning Chronicle* the first of that series of *Sketches by Boz* which brought Dickens into fame. A new class of characters, eccentric indeed, but vital representations of the humors and oddities of life, such as Mr. Pickwick, Sam Weller and his father, Mr. Winkle, and others, were made familiar to the public. Under the name of the *Posthumous Papers of the Pickwick Club* this work was published in two volumes 8vo in 1837. In the same year Dickens was engaged as editor of *Bentley's Magazine*, to which he contributed *Oliver Twist*, a work which opened up that vein of philanthropic pathos and indignant satire of institutions which became a distinguishing feature of his works. As the special object of *Oliver Twist* was to expose the conduct of workhouses, that of *Nicholas Nickleby* was to denounce the management of cheap boarding schools. *Master Humphrey's Clock*, issued in weekly numbers, contained among other matter two other leading tales, *The Old Curiosity Shop*, and *Barnaby Rudge*, the latter a historical tale. In 1841 Dickens visited America, and on his return he wrote *American Notes for General Circulation.* His next novel, *Martin Chuzzlewit*, dwelt again on his American experiences. The series of *Christmas Tales*, in which a new element of his genius, the power of handling the weird machinery of ghostly legend in subordination to his own peculiar humor, excited a new sensation of wonder and delight. These enumerated consecutively were: *A Christmas Carol*, *The Chimes*, *The Cricket on the Hearth*, *The Battle of Life*, *The Haunted Man*, and the *Ghost's Bargain.* The extraordinary popularity of these tales created for a time a new department in literature, that of the sensational tale for the Christmas season. In 1845 Dickens went to Italy, and on his return the *Daily News* was intrusted to his editorial management; but this was an occupation uncongenial to his mind, and in a few months the experiment was abandoned. *His Pictures from Italy* were published the same year. Next followed his novel of *Dombey and Son*, and *David Copperfield*, a work which has a strong autobiographical element in it. In 1850 Dickens became editor of the weekly serial *Household Words.* In 1853 his *Bleak House* came out. *A Child's History of England*, commenced in *Household Words*, was published in 1852–54. *Hard Times* was published in 1854. *Little Dorrit*, commenced in 1856, dealt with imprisonment for debt, the contrasts of character developed by wealth and poverty, and executive imbecility, idealized in the *Circumlocution Office.* In 1859 *All the Year Round* superseded *Household Words;* and in the first number of this periodical was begun *A Tale of Two Cities. Great Expectations* followed in the same paper in 1860. *In All the Year Round* also appeared a series of disconnected sketches, called the *Uncommercial Traveller. Our Mutual Friend*, completed in 1865, and published in the usual monthly numbers, with illustrations by Marcus Stone, was the last great serial work which Dickens lived to finish. The first number of his last work, *The Mystery of Edwin Drood*, was issued in 1870, and only three numbers had appeared when he d. somewhat suddenly, at his residence, Gad's Hill Place, near Rochester, on June 9. He was buried in Westminster Abbey. Dickens's work as a novelist is firmly based upon wide and keen observation of men.

Dickinson, Anna Elizabeth, orator, was b. in Philadelphia, Pa., 1842. In 1857 she made her first venture as a speaker before the members of a society of "Progressive Friends," who were interested in the antislavery movement. In 1859–60 she taught school in Berks co., Pa., and in 1861, for about nine months, was employed at the U. S. mint, in Philadelphia. After that time she lectured in public. This she did with so much acceptation that, in 1862, she was invited to deliver an oration at Music Hall, in Boston, Mass., under the auspices of the New England leaders of the anti-slavery cause. From there she went to New Hampshire and Connecticut, and later drew large attendances in Cooper Union. New

York City, and at the Academy of Music, Philadelphia. After the close of the war she appeared mostly as a lecturer on the platform of literary societies. In 1876 she entered the dramatic profession, but this venture was unsuccessful.

Dickinson, DANIEL STEVENS (1800–1866), b. in Goshen, Conn., statesman. He became clerk in a clothing store, and afterward surveyed, taught school, and studied law. He became qualified as a lawyer in 1828, and as such settled in Guilford. In 1831 he removed to Binghamton. He became prominent as a Democratic politician, and in 1836 was chosen state senator. In 1842 he was chosen lieutenant governor of New York. 1844 he was appointed to fill a vacany in the U. S. Senate, and later the legislature elected him for the full term. In 1852 he was nominated collector of the port of New York, which office he declined. From 1861 to 1863 he was active on the stump in making addresses on the national side; in 1861, also, he was elected attorney general for the southern district of New York.

Dickinson, JOHN (1732–1808), statesman, studied law in Philadelphia and at the Temple, London, and practised his profession in Philadelphia. In 1763 he was elected to the assembly. In 1798 he published his *Letters to the Inhabitants of the British Colonies, by a Pennsylvania Farmer*, showing that Parliament had no right to tax the colonies, and to him is due the phrase "no taxation without representation." These were republished in London by Benjamin Franklin, as the best presentation of the case, and they were also translated into French and commended by Voltaire. He was a member of the committee to draft the Declaration of Independence. He entered the army as a private. In 1779 he was elected to Congress from Delaware. In 1780 he was made a member of the assembly of Delaware, and was afterward president of that body. In 1872 he was made president of the supreme executive council of Pennsylvania.

Dicta'tor, an extraordinary magistrate of the Roman Republic, first instituted B. C. 501. The power of naming a dictator when an emergency arose requiring a concentration of the powers of the state in a single superior officer, was vested by a resolution of the senate in one of the consuls. The dictatorship was limited to six months, and the person who held it could not go out of Italy. The dictator was also forbidden to appear in Rome on horseback without the permission of the people, and he had no control over the public funds without the permission of the senate. He had the power of life and death, and could punish without appeal to the senate or people. All the other magistrates were under his orders.

Dictionary, a book containing the words, or subjects, which it treats, arranged in alphabetical order. It may be either a vocabulary, or collection of the words in a language, with their definitions; or a special work on one or more branches of science or art prepared on the principle of alphabetical arrangement,

such as dictionaries of biography, law, music, medicine, etc. Among dictionaries of the English language, the earliest seem to have been those of Barett, 1573, and of Bullokar, 1616. That of Dr. Johnson published in 1755 made an epoch in this department of literature. Previous to this the chief English dictionary was that of Bailey, a useful work in its way. An enlarged edition of Johnson's dictionary, by the Rev. H. J. Todd, appeared in 1818; and this, again enlarged and modified, was issued under the editorship of Dr. R. G. Latham (1864–72). The chief American dictionary of the English language is that by Noah Webster first published in 1828. It has been frequently republished, and in subsequent editions has almost entirely altered its character. Dr. Richardson's dictionary, first published in two volumes in 1836–37 (at London), is valuable chiefly for its copious illustrative quotations. The large American dictionary by Dr. Worcester has made a good position for itself. Dr. Ogilvie's English dictionary (based on Webster, and first published in 1847–50), has recently been published in a remodeled and enlarged form (4 vols. 1881–82, Chas. Annandale, LL.D., editor). Cassell's *Encyclopædic Dictionary*, is another extensive and useful work (1879–88). The *Standard Dictionary* and the *Century Dictionary* are the latest finished works in English lexicography on a large scale. The chief etymological dictionary of English words is that by Prof. Skeat (1882); the chief French is that of Littré; German, that of Grimm.

Didactic Poetry, that kind of poetry which professes to give a kind of systematized instruction on a definite subject or range of subjects. Thus the *Georgics of Vergil* and the *De Rerum Natura* of Lucretius profess to give, the one a complete account of agriculture and kindred arts, the other a philosophical explanation of the world. In a larger sense of the word most great poems might be called didactic, since they contain a didactic element in the shape of history or moral teaching, Dante's *Divina Commedia*, Milton's *Paradise Lost*, or Goethe's *Faust*, for example. The difference may be said to be this, that in the one case the materials are limited and controlled by nothing but the creative fancy of the poet, while in the other they are much more determined by the actual nature of the subject treated of.

Diderot (dēd-rō), DENIS (1713–1784), a French writer and philosopher, was b. at Langres, in Champagne, and educated in the school of the Jesuits, and afterward at Paris, at the College of Harcourt. His first works were the *Essai sur le Mérite et la Vertu* (1745); and the *Pensées Philosophiques* (1746), a pamphlet against the Christian religion. His *Lettre sur les Aveugles à l'Usage de Ceux qui Voyent*, is in the same strain. These heterodox publications cost him an imprisonment for some time at Vincennes. Diderot now tried writing for the stage, but his pieces were failures. In 1749 he had begun along with D'Alembert and some others the *Encyclopædia*. At first it was intended to be mainly a translation of one already pub-

lished in English by Chambers. Diderot and D'Alembert, however, enlarged upon this project, and made the new *Encyclopædia* a magnificently comprehensive and bold account of all the thought and science of the time. Besides his articles in the *Encyclopædia* he wrote numerous works, some of which were published after his death.

Dido (or Elissa), the reputed founder of Carthage. She was the daughter of the king of Tyre, and after her father's death her brother Pygmalion murdered her husband, Sicharbas, or as Vergil calls him Sichæus, with the view of obtaining his wealth. But Dido, accompanied by many Tyrians of her party, fled with all the treasure over sea, and landing on the coast of Africa founded Carthage about 860 B. C.

Didym'ium, a rare metallic element occurring along with *lanthanium* in the mineral cerite as discovered by Mosander in 1843. Recently it is said to have been resolved into two new elements: *Praseodymium* and *Neodymium.*

Dielectric, a name applied by Faraday to any medium through or across which electrostatic induction can take place. Faraday first showed that electrostatic induction was not action at a distance, but took place by means of the insulating medium separating the two conductors. The medium he named a *dielectric*, and measured its specific inductive capacity by taking that of common air as unity,

Dieppe (dē-ep'), a seaport town, France, department Seine-Inférieure, on the English Channel, at the embouchure of the Arques, 93 mi. n.n.w. Paris. Dieppe is one of the chief watering places of France, and is much frequented by visitors in summer and autumn. The manufactures include works in ivory, the most famed in Europe; works in horn and bone, lace-making, sugar-refining, shipbuilding, etc. There is a busy fishery, and the foreign trade is still considerable. In early times Dieppe was the chief port of France, but its prosperity diminished after the revocation of the Edict of Nantes (1685). Pop. 20,804.

Diesinking is the art of preparing dies for stamping coins, buttons, medallions, jewelry, fittings, etc. The steel for the manufacture of dies is carefully selected, forged at a high heat into the rough die, softened by careful annealing, and then handed over to the engraver. After the engraver has worked out the design in intaglio the die is put through the operation of hardening, after which, being cleaned and polished, it is called a *matrix.* This is not, however, generally employed in multiplying impressions, but is used for making a *punch* or steel impression for relief. For this purpose another block of steel of the same quality is selected, and being carefully annealed or softened, is compressed by proper machinery upon the matrix till it receives the impression. When this process is complete the impression is retouched by the engraver, and hardened and collared like the matrix. Any number of dies may now be made from this punch by impressing upon it plugs of soft steel. In place of this process patterns are now frequently engraved upon rollers for transference to sheet metal by rolling pressure.

Di'et, a meeting of some body of men held for deliberation or other purposes; a term especially applied to the legislative or administrative assemblies of the German Empire, Austria, etc.

Dietet'ics, that part of medicine which relates to the regulation of diet. The ideal diet is clearly that which, without burdening the viscera uselessly, furnishes all necessary nutritive elements, with due consideration for special physiological conditions in any given case. No single substance contains the elements needed to replace its waste in their requisite proportions and a mixed diet is therefore necessary. The nature of the food most suitable for a healthy man is dependent in part upon general conditions, such as climate and season, and in part upon special conditions of individual habit.

Differential Thermometer, an instrument for determining very minute differences of temperature. Leslie's differential thermometer consists of two glass bulbs containing air connected by a bent tube containing some sulphuric acid, the movement of which serves to indicate any slight difference of temperature between the two bulbs.

Digest'er, a strong vessel of copper or iron, on which is screwed an air-tight cover with a safety valve, the object being to prevent loss of heat by evaporation. Water may be thus heated to 400° F., at which temperature its solvent power is so greatly increased that bones are converted into a jelly.

Digit, in arithmetic, any one of the ten numerals, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. Digit is also a measure of a finger's breadth, equal to ¾ in. *Digit*, in astronomy, is the measure by which we estimate the quantity of an eclipse. The diameter of the sun or moon's disk is conceived to be divided into twelve equal parts, called *digits;* and according to the number of those parts or digits which are obscured, so many digits are said to be eclipsed.

Digitigra'da, a section of the Carnivora, so called from their walking on the ends of their toes; as distinguished from the Plantigrada, which, like the bear, place the whole foot upon the ground. This tribe includes the weasel, dog, cat, etc.

Dijon (dē-zhōn), a town in eastern France, capital of the department Côte-d'Or. It has important educational institutions and a valuable library. Industries: woolens, hosiery, candles, mustard, vinegar, chemicals, paperhangings, etc., tanneries, foundries, machine factories, cotton and oil mills. The trade is considerable, particularly in the wines of Burgundy. Pop. 60,855.

Dilem'ma, in logic, an argument in which the same conclusion may be drawn from two contrary propositions. We append one of the most famous of the classical dilemmas. A young rhetorician said to an old Sophist: "Instruct me in pleading and I shall pay you when I gain a cause." The master sued for the re-

ward, and the scholar eluded the claim by a dilemma. "If I gain my cause I shall not pay you, because the award of the judge will be against you. If I lose it I may withhold it, as I shall not have gained a cause." The master replied: "If you gain you must pay me, because you promised to pay me when you gained a cause; if you lose you must pay me, because the judge will award it." The two results which are found equally objectionable are called the "horns" of a dilemma.

Dill, an umbelliferous plant, a native of the southern countries of Europe, the fruits (commonly but erroneously called seeds) of which are moderately warming, pungent, and aromatic, and are employed medicinally as a carminative. In appearance it resembles the fennel. Dill seeds yield dill water and an essential oil, when distilled with water. Dill water is used as a remedy in flatulency and gripes of children.

Dillon, JOHN, Irish statesman, b. in Ireland in 1851; entered Parliament in 1880 as a home ruler, was twice imprisoned as a "suspect," and was considered as Parnell's chief lieutenant in the House of Commons.

Dim'ity, a stout cotton fabric, ornamented in the loom either by raised stripes or fancy figures. It is usually employed white, as for bed and bedroom furniture.

Dina'pur, a town, Hindustan, Patna district, Bengal, on the right bank of the Ganges, about 12 mi. n. w. of Patna, cantonment and military headquarters of the district, with extensive barracks. The environs are studded with handsome bungalows. Pop., with cantonment, 37,893.

Dingo, the native wild dog of Australia, of a wolf-like appearance and extremely fierce. The ears are short and erect, the tail rather

Dingo.

bushy, and the hair of a reddish-dun color. It is very destructive to the flocks, killing more than it eats.

Dino'ceras, a fossil mammal found in the Eocene strata of North America, in some respects akin to the elephant and of equal size, but without a proboscis.

Dinor'nis, an extinct genus of large wingless birds — classed among the ostrich tribe — the bones of five species of which have been found in New Zealand. The largest must have stood at least 14 ft. in height, several of its

bones being at least twice the size of those of the ostrich.

Dinosau'ria, a group of colossal lizards, resembling the pachydermatous mammals in general appearance, but in reality intermediate between the struthious birds and lizards. The majority, as the Megalosaurus, which attained to 40 ft. in length, were carnivorous; the Iguanodon, however, was herbivorous. They were the land reptiles of the Jurassic, Wealden, and inferior Cretaceous continents.

Dinothe'rium, a genus of extinct gigantic mammals, the remains of which occur in Tertiary formations in several parts of Europe.

Dinotherium.

Dinwiddie, ROBERT (1690–1770), colonial governor of Virginia, was b. in Scotland and was governor of Virginia from 1752 to 1758, when he was recalled, after precipitating the French and Indian War, and by his ill temper, avarice, and incompetence, rendering himself generally unbearable to the Americans.

Diocle'tian (C. Valerius Diocletianus, surnamed *Jovius*), a man of mean birth, a native of Dalmatia, proclaimed Emperor of Rome by the army 284 A.D. He defeated Carinus in Mœsia (286), conquered the Allemanni, and was generally beloved for the goodness of his disposition, but was compelled by the dangers threatening Rome to share the government with M. Aurelius Valerius Maximian.

Diogenes OF SINOPE (B.C. 412–323), the most famous of the Cynic philosophers. Having been banished from his native place with his father, who had been accused of coining false money, he went to Athens, and thrust himself upon Antisthenes as a disciple. Like Antisthenes he despised all philosophical speculations, and opposed the corrupt morals of his time; but while the stern austerity of Antisthenes was repulsive, Diogenes exposed the follies of his contemporaries with wit and good humor. As an exemplar of Cynic virtue he satisfied his appetite with the coarsest food, practised the most rigid temperance, walked through the streets of Athens barefoot, without any coat, with a long beard, a stick in his hand, and a wallet on his shoulders, and by night, according to the popular story, slept in a tub (or large earthenware vessel).

Diomede Islands, a group of three small islands in Bering's Strait, and midway between Asia and America.

Diomedes (dī-o-mē'dēz), in Greek mythology, 1, A king of the Bistŏnes, who fed his

horses on human flesh, and used to throw all strangers who entered his territories to those animals to be devoured. He was killed by Hercules, who carried off the horses. 2, One of the heroes at the siege of Troy, the son of Tydeus and Deipyle, and king of Argos, one of the suitors of Helen.

Dionysius, the Elder (B.C. 430–367), in Greek history, tyrant or absolute ruler of Syracuse, b. of obscure parentage. He obtained the rank of general, and afterward of commander-in-chief; and gaining the support of the army, he seized the supreme power in Syracuse, though only twenty-five years of age. He extended his rule over other cities in Sicily; and after some successes and reverses in the struggle with the Carthaginians he gained a complete victory over them under the walls of Syracuse.

Dionysius, the Younger, a tyrant of Syracuse, who in 367 B. C. succeeded his father, Dionysius the Elder.

Diora′ma, a mode of painting and of scenic exhibition invented by Daguerre and Bouton, and first exhibited in 1823. It secures a higher degree of illusion than the ordinary panorama, by a mode of uniting transparent painting to the usual opaque method, and causing the light to fall upon the picture both from *before and behind.* At the same time, by means of colored transparent blinds, suspended both above and behind the picture, the rays of light can be intercepted and made to fall at pleasure in graduated tints upon every part of the picture in succession.

Dip, in geology, the inclination or angle at which strata slope or *dip* downward into the earth. The degree of inclination or amount of the dip, which is easily measured by a special instrument, is determined by the angle which a line drawn perpendicular to the direction of the stratum makes with the horizon. The line in which such strata cut the surface is called the *strike,* and is always at right angles to the dip.

Diphthong, a coalition or union of two vowels pronounced in one syllable. In uttering a proper diphthong both vowels are pronounced; the sound is not simple, but the two sounds are so blended as to be considered as forming one syllable, as in *void, bough.* The term improper diphthong is applied to the union in one syllable of two or more vowels, of which only one is sounded, as in *bean.*

Di′phyodont, a term applied to those animals which develop two sets of teeth, a deciduous or milk set, and a permanent set—as distinct from the monophyodonts, which develop only one set. The majority of mammals are diphydont, though the number of teeth replaced may vary: thus in man twenty teeth of the adult are preceded by a milk set; in the hare, the anterior incisors are not so preceded, but the posterior smaller incisors replace an earlier pair.

Diplei′doscope, an instrument for indicating the passage of the sun or a star over the meridian, by the coincidence of two images of the object, the one formed by single and the other by double reflection. It consists of an

equilateral hollow prism, two of whose sides are silvered on the inside so as to be mirrors, while the third is formed of glass. The prism is adjusted so that one of the silvered sides shall be exactly in the plane of the meridian, and the transparent side toward the object.

Diplo′macy, the science or art of conducting negotiations, arranging treaties, etc., between nations; the branch of knowledge which deals with the relations of independent states to one another; the agency or management of envoys accredited to a foreign court; the forms of international negotiations. The Cardinal de Richelieu is generally considered as the founder of that regular and uninterrupted intercourse between governments which exists at present between almost all the Christian powers; though the instructions given by Machiavelli to one of his friends, who was sent by the Florentine Republic to Charles V (Charles I of Spain) show that Richelieu was not the first to conceive the advantages that might be derived from the correspondence of an intelligent agent accredited at the seat of a foreign government. Diplomatic agents are of several degrees: 1, ambassadors; 2, envoys extraordinary and ministers plenipotentiary; 3, ministers resident; 4, *chargés d′affaires;* 5, secretaries of legation and *attachés.*

Diplomat′ics, originally the science of deciphering ancient MSS. It laid down certain principles for the systematic examination of public documents, and taught the forms and styles adopted in them, the titles and rank of public officers subscribing them.

Dip′noi, an order of fishes, including only the singular mudfishes, important as exhibiting the transition between fishes and the amphibia. Formerly Lepidosiren was reckoned the lowest of the amphibia; now it constitutes the highest order of fishes. The body is fish-like in shape, covered with small horny scales of a cycloid character; the pectoral and ventral fins are represented by two pairs of long filiform organs; the heart has two auricles and one ventricle, and the respiratory organs are twofold, consisting of ordinary gills opening externally, and of true lungs—formed by the modified swimming-bladder—communicating with the œsophagus by means of an air-duct or trachea, whence the name.

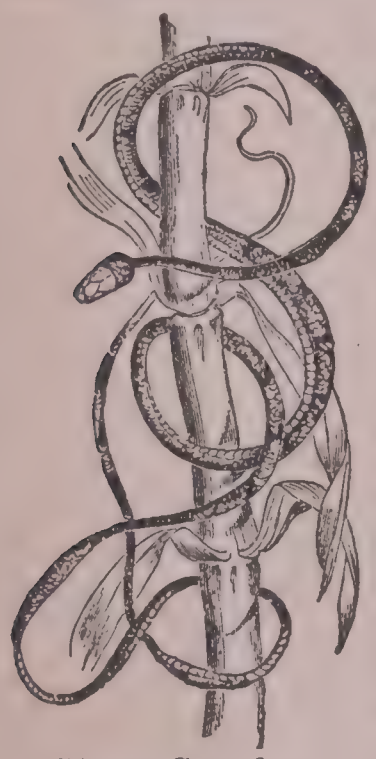
Dippel's Oil, the rectified form of the black fetid oil, containing ammonic carbonate, which can be obtained by the destructive distillation of animal matter, such as stag's horn, ivory, or blood. The cruder form was used in medicine, despite its appearance and odor, until Dippel refined it. His oil was formerly prescribed as an anti-spasmodic and diaphoretic, and as a hypnotic.

Dipper, a bird of the genus *Cinclus,* allied to the thrushes. The common dipper, water ousel, or water crow, is about 7 in. in height, with a very short tail, small rounded wings, and large powerful feet; the bill is of moderate length, straight and slender. The male has the upper part of the body dark brown, the throat and breast white, belly rusty. The

Water Ousel.

dipper frequents streams, and feeds largely on water insects and larvæ.

Dipping Needle, or Inclination Compass, an instrument for showing the direction of one of the components of the earth's magnetism. In essentials the instrument consists of a light magnetized steel bar supported on a horizontal axis which passes, as nearly as possible, through the center of inertia of the bar. When a needle thus mounted is placed anywhere not in the magnetic equator, it dips or points downward; and if the vertical plane, in which it moves, coincides with the magnetic meridian the position of the needle shows at once the direction of the magnetic force. The intersection of two or more directions, found by making the experiment at different places, indicates the place of the magnetic pole.



Dipsas Cyandon.

Dipsas, a genus of Asiatic and tropical American non-venomous serpents of the family Colubridæ, of very elongated form. With the ancients it was a serpent whose bite was said to produce a mortal thirst.

Dip'tera, an order of two-winged insects, of which the common house-fly and blue-bottle are familiar examples.

Direc'trix, in math. a line perpendicular to the axis of a conic section, and so placed that the distance from it of any point in the curve is to the distance of the same point from the focus in a constant ratio; also, the name given to any line, whether straight or not, that is required for the description of a curve. The directrix of a parabola is a line perpendicular to the axis produced, and whose distance from the vertex is equal to the distance of the vertex from the focus.

Disc (disk), the central part of a radiate, compound flower surrounded by the ray. Also a part, sometimes cup-shaped, at the base of the stamens, consisting in some cases of rudimentary stamens, in others of the modified receptacle. In astronomy the term is applied to the face or circular figure exhibited by the sun, moon, or planet in the sky.

Dis'count, the charge made by a banker for interest of money advanced by him on a bill or other document, not presently due. In advancing money on such a security the banker deducts a charge for interest on his advance from the total amount represented on the security, pays the difference, which is called the *proceeds* of the bill, to the person parting with it, and collects the full amount to reimburse himself for outlay and interest at maturity. Popularly the term *discount* is applied to any deduction from the full amount of an account made by the party to whom it is paid, especially on prompt or early payment. When a bill which has been *discounted* is paid by the acceptor before it is due, the discount allowed for prepayment is called *rebate.*

Dis'crase, an ore of silver, consisting of antimony and silver. It occurs in hexagonal prisms, massive, disseminated, or granular.

Dismal Swamp, a large tract of marshy land in the U. S., beginning a little s. of Norfolk, in Virginia, and extending into North Carolina, containing 150,000 acres: 30 mi. long, from n. to s., and 10 broad. This tract was entirely covered with trees, with almost impervious brushwood between them, but it has now in part been cleared and drained. In the midst of the swamp is a lake, called *Drummond's Pond,* 7 mi. in length. A navigable canal through the swamp connects Chesapeake Bay and Albemarle Sound.

D'Israeli (diz-rā'e-li), Isaac (1766–1848), English man of letters, and father of the well-known statesman, was b. at Enfield, Middlesex. An anonymous reply to Peter Pindar, entitled *On the Abuse of Satire,* was followed in 1791–1793 by the appearance of his *Curiosities of Literature,* the success of which determined much of his after work. His essay on the *Literary Character* was published in 1795, and some time afterward a volume of romantic tales, *The Loves of Mejnoun and Leila.* Between 1812 and 1822 appeared his *Calamities of Authors, Quarrels of Authors,* and *Inquiry into the Literary and Political Character of James I;* the three being afterward published collectively under the title of *Miscellanies of Literature.* In 1828 appeared the commencement of his *Life and Reign of Charles I,* a work completed in 1831. The greater part of his life was passed in his library.

Dis'taff, the first instrument employed in spinning. It consisted of a staff, on one end of which the wool or wax was rolled. The spinner held it in the left hand, and drew out the fibers with the right, at the same time twisting them. A small piece of wood called a spindle was attached to the thread, the weight of which carried it down as it was formed. When the spindle reached the ground the thread which had been spun was wound round it, and it was then again fastened near the beginning of the new thread.

Distemper, in painting, a preparation of opaque color mixed in a watery glue, such as size, white of egg, or gum. It is used now chiefly in scene-painting and in paper for walls, but was employed in the higher departments of art before the introduction of oil-painting in the fifteenth century. Distemper is painted on a dry surface, fresco on wet mortar or plaster.

Distillation, the volatilization and subsequent condensation of a liquid by a special apparatus, resulting in the separation of the liquid from a mixture. The operation is performed by heating the crude liquid or mixture in a retort or vessel known as the *body of the still.* This is made of various shapes and materials, and is closed with the exception of a slender neck, which opens into the condenser, a long tube through which the hot vapor from the still is passed. The tube is kept at a sufficiently low temperature to cause the vapor to condense, the common method of securing this being to surround the tube with a constantly renewed stream of cold water. In some cases ice or a freezing mixture may be required to effect condensation. On a large scale the condensing tube is coiled round and round in a tub or box, and is known as a *worm.* From the end of it the vapor condensed into a liquid drops or distils into a receiver. The simplest case of distillation is that of water containing solid matter in solution, the solid matter remaining behind in the still or retort while the water trickles pure into the receiver. The cold water round the worm requires to be continually renewed, as otherwise it gets heated. When the mixture to be distilled consists of two or more fluids of different boiling points, such as alcohol and water, the more volatile comes off first, accompanied by a certain proportion of the vapor of the other, so that it is hardly possible completely to separate bodies by one distillation. This is effected by repeated successive distillations of the liquid with or without the addition of substances to retain the impurities. When the production of one of the ingredients only is aimed at by this process, it is called *rectification,* but when it is desired to separate and collect all the liquids present, or to divide a mixture into portions lying within certain ranges of temperature ascertained either by the thermometer or by the amount of liquor run off, or by the appearance of the distillate, etc., the process is called *fractional distillation.* In the laboratory, distillation is employed for purifying water, for recovering alcohol and ether, for the preparation, purification, and separation of a great number of bodies. On the large scale, distillation is employed in the preparation of potassium, sodium, zinc, mercury; of sulphuric acid, ether, chloroform, sulphide and chloride of carbon, essential oils and perfumes; purification of coal and wood tar, and the products obtained from them; and most extensive of all, the manufacture of whisky, brandy, or other spirit. Sea water is also distilled in many cases for drinking or cooking purposes. *Destructive distillation* differs from the preceding in this respect, that the original substance is not merely separated into the bodies by the mixture of which it is formed, but is so acted on that it is completely decomposed, and bodies are produced which had no existence in the original matter. The term is restricted to the action of heat upon complex organic substances out of contact with the air. The products of destructive distillation are numerous and varied. On the manufacturing scale the process is conducted sometimes for one part, sometimes for another part of the products. Coal, for example, is distilled primarily for the gas, but also for ammoniacal water, benzol, anthracene, and sometimes for the sake of the fixed carbon or coke, the volatile portions being neglected and practically wasted. Wood is distilled partly for the sake of the pyroligneous acid and the tar, partly for the charcoal. Bones are distilled for the sake of the charcoal, though the oil is also collected. Shale is distilled solely for the sake of the oil.

District of Columbia. See *Columbia.*

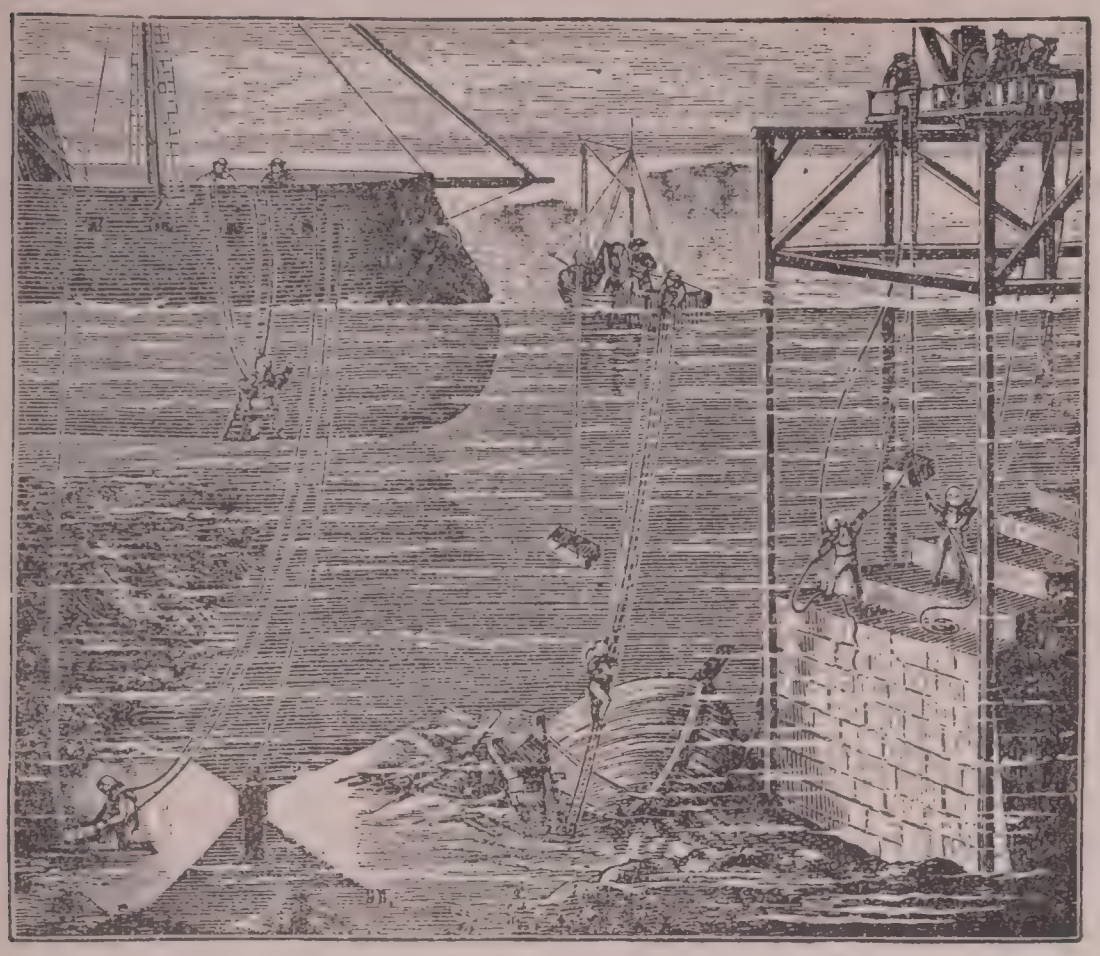
Ditmarshes, a district of Holstein, in Germany, consisting of a monotonous flat stretching along the German Ocean, between the mouths of the Elbe and the Eider, and so little raised above the sea as to require the protection of strong embankments. The area is 500 sq. mi., and the total pop. above 70,000.

Diu, an island of Hindustan belonging to the Portuguese. It was formerly the seat of a considerable commerce, but is now a place of no importance. Pop. 12,636.

Divers, birds remarkable for the habit of diving. The divers (Colymbidæ) are a family of swimming birds (Natatores), characterized by a strong, straight, rather compressed, pointed, bill about as long as the head; a short and rounded tail; short wings; thin, compressed legs, placed very far back, and the toes completely webbed. They prey upon fish, which they pursue under water, making use partly of their wings, but chiefly of their legs and webbed feet in their subaqueous progression. The leading species are the great northern diver, the red-throated diver, and the black-throated diver. These birds inhabit the Arctic seas of the New and Old Worlds; they are abundant in the Hebrides, Norway, Sweden, and Russia. The great northern diver, loon, or ember-goose, is about 2¾ ft. long, and is of handsome plumage.

Great Northern Diver.

Dividing Range, Great, an Australian chain of mountains, forming the watershed between



Divers at Work.

the rivers flowing into the Pacific and those running westward. It is situated at an average distance of 30 mi. from the sea, though in some places it recedes as much as 60 mi., and stretches from Cape York on the north to Wilson's Promontory on the south. Culminating point Mount Townshend (7,353 ft.).

Divi-divi (Libi-dibi or Libi-davi), the pods of *Cæsalpinia coriaria*, a tree which grows in tropical America, and a member of the family which yields sapan, brazil, and other red woods. The pods are about 1 in. broad and 3 in. long, but are generally bent or curled up; are excessively astringent, containing a large proportion of tannic and gallic acid, for which reason they are used by tanners and dyers.

Divination, the act of divining; a foretelling future events, or discovering things secret or obscure, by the aid of superior beings, or by other than human means. In ancient times divination was divided into two kinds, *natural* and *artificial*. *Natural* divination was supposed to be effected by a kind of inspiration or divine afflatus; *artificial* divination was effected by certain rites, experiments, or observations, as by sacrifices, observation of entrails and flight of birds, lots, omens, position of the stars, etc. Among modes of divination were *axinomancy*, by axes; *belomancy*, by arrows; *bibliomancy*, by the Bible; *oneiromancy*, by dreams; *pyromancy*, by fire, etc.

Divine Right, the claim set up by some sovereigns or their supporters to the absolute obedience of subjects as ruling by appointment of God, insomuch that, although they may themselves submit to restrictions on their authority, yet subjects endeavoring to enforce those restrictions by resistance to their sovereign's acts are considered guilty of a sin. This doctrine, so celebrated in English constitutional history, especially in the time of the Stuarts, may now be considered to be exploded.

Diving, the art or act of descending into water to considerable depths, and remaining there for a time. The uses of *diving* are important, particularly in fishing for pearls, corals, sponges, examining the foundations of bridges, recovering valuables from sunken ships, and the like. Without the aid of artificial appliances a skillful diver may remain under water for two, or even three minutes; accounts of longer periods are doubtful or absurd. Various methods have been proposed and engines contrived to render diving more safe and easy. The great object in all these is to furnish the diver with fresh air, without which he must either make but a short stay under water or perish.

Diving-bell, a contrivance for the purpose of enabling persons to descend and to remain below the surface of water for a length of time, to perform various operations, such as examining the foundations of bridges, blasting rocks, recovering treasure from sunken vessels, etc. Diving-bells have been made of various forms, more especially in that of a bell or hollow truncated cone, with the smaller end closed, and the larger one, which is placed lowermost, open. The air contained within these vessels prevents them from being filled with water on submersion, so that the diver may descend in them and breathe freely for a long time, provided he can be furnished with a new supply of fresh air when the contained air becomes vitiated by respiration. The diving-bell is generally made of cast iron, and has several strong convex lenses set in the upper side or roof, to admit light to the persons within. It is suspended by chains from a barge or lighter, and can be raised or lowered at pleasure upon sig-

Diving-bell, Inside and Top.

nals being given by the persons within, who are supplied with fresh air injected into a flexible pipe by means of forcing pumps placed in the lighter, while the heated air escapes by a cock in the upper part of the bell. The illustration shows the most recent form of diving apparatus in use on the river Clyde, in which steam is applied to operate all the movements required. A form, called the *nautilus*, has been invented which enables the occupants, and not the attendants above, to raise or sink the bell, move it about at pleasure, or raise great weights with it and deposit them in any desired spot.

Diving-dress.

Diving-dress, a waterproof dress made of india-rubber cloth used by professional divers, and covering the entire body except the head. The dress has a neck-piece or breastplate, fitted with a segmental screw bayonet joint, to which the head-piece or helmet, the neck of which has a corresponding screw, can be attached or removed. The helmet has usually three eyeholes, covered with strong glass, and protected by guards. Air is supplied by means of a flexible tube which enters the helmet and communicates with an air-pump above. To allow of the escape of the used air there is sometimes another flexible tube, which is led from the back part of the helmet to the surface of the water. But in the more improved forms of the dress, the breathed air escapes by a valve so constructed as to prevent water from getting in, though it lets the air out. Leaden weights are attached to the diver, and his shoes are weighted, that he may be able to descend a ladder, walk about below, etc. Communication can be carried on with those above by means of a cord running between the diver and the attendants; or he may converse with them through a speaking tube or a telephonic apparatus. One form of diving-dress makes the diver independent of any connection with persons above the water. It is elastic and hermetically closed. A reservoir containing highly compressed air is fixed on the diver's back, which supplies him with air by a self-regulating apparatus at a pressure corresponding to his depth. When he wishes to ascend he simply inflates his dress from the reservoir. Another form, known as the Fleuss dress, makes the diver also independent of exterior aid. The helmet contains a supply of compressed oxygen, and the exhaled breath is passed through a filter in the breast-piece which deprives it of its carbonic acid, while the nitrogen goes back into the helmet to be mixed with the oxygen, the supply of which is under the diver's own control, and to be breathed over again. A diver has remained an hour and a half under 35 feet of water in this dress. The safe limit of depth at which operations can be carried on with the diving-dress is 120 to 150 feet. Diving for pearls, sponges, or corals is now to a great extent carried on by means of diving-dresses.

Divining Rod, a rod, usually of hazel, with two forked branches, used by persons who profess to discover minerals or water under ground. The rod, if carried slowly along by the forked ends, dips and points downward, it is affirmed, when brought over the spot where the concealed mineral or water is to be found. The use of the divining-rod is still common in many parts, and quite recently various wonderful instances of its efficacy in discovering water have been published in respectable prints.

Division of Labor, a principle employed in great industries for the simplification of the work to be done by each of the workmen engaged in it. The separation of complicated processes into a series of simple operations not only results in a great saving of time, but also demands much less ability on the part of the workman, in order that he may acquire the necessary skill in performing any particular operation. Owing to both of these causes, the saving of time, and the employment of cheaper labor, the cost of producing complicated articles is, by the application of this principle, immensely reduced. Division of labor tends to the invention of machinery, and to the effectual use of machinery when invented. It increases the skill and dexterity of the individual workman; it effects a great saving of time and capital, and it conduces to the more economical distribution of labor by classing work-people according to their capacity. It has, however, a deteriorating effect on the laborer's usefulness as an all-round workman.

Dix, John Adams (1798–1879), statesman and soldier, b. in Boscawen, N. H.; d. in New York City. In 1814 he became third lieutenant in the Twenty-third Infantry, and, in June, 1814, was transferred to the artillery. He was made first lieutenant in 1816; aide-de-camp to General Brown in 1819; was transferred to the First, then to the Third Artillery in 1821; and appointed captain in 1825. In 1826 he resigned his commission, studied law, and was admitted to the bar in 1828; was appointed secretary of state for New York in 1833; was elected to the state assembly in 1842; and U. S. senator in 1845; was assistant treasurer of the U. S. in 1853; postmaster of New York in 1859; and secretary of the treasury in Buchanan's cabinet in 1861. At the beginning of the Civil War he entered the army and was appointed brigadier general and major general of volunteers. In 1866 he was appointed min-

ister to Paris; and in 1872, was elected governor of New York. He edited a literary journal, *The Northern Light;* published various translations.

Dixie (or Dixie's Land), a term which came, by a popular error, to be identified with the South and Southern institutions during the Civil War. It is derived from a Northern negro refrain, which was sung in New York about the beginning of the nineteenth century, and which expressed the supposed regrets of the slaves of a man Dixie, who had shipped his slaves to the South as the abolition sentiment grew stronger. This rude chant afterward was developed into the melody that for a time became the rival of *Yankee Doodle.*

Dixon, Lee co., Ill., on Rock River, 98 mi. from Chicago. Railroads: C. & N. W., and Illinois Central. Industries: piano, shoe, box, sash and blind, and woven-wire factories, planing mill, and condensed-milk factory. Surrounding country agricultural. Dixon was the base of supplies during the Black Hawk War. The town was first settled in 1828 by John Dixon. Pop. 1900, 7,917.

Dizful, a town of Persia, near the western boundary, on the river Dizful; a place of great trade and manufactures. Pop. 30,000.

Djokdjokarta, a Dutch residency in the island of Java. Its forests abound in teak. Its natural fertility is great, and rice, coffee, and tobacco are extensively cultivated. It is ruled by a sultan who is dependent on the Dutch. Pop. 441,800. The town is large and regular, and contains the sultan's water-palace, and the seat of the Dutch resident, which is a fort commanding both the palace and the town. Pop. 45,000.

Dnieper (nē'pẽr), a great river of Russia which rises in the government of Smolensk, flows first southwest, then southeast, and latterly again southwest to the Black Sea. It begins to be navigable a little above Smolensk, and has a total length, including windings, of 1,230 mi. Among its tributaries are the Beresina, the Pripet, the Desna, and the Psiol. In its lower course there are important fisheries. Between Kiev and Alexandrovsk it forms a series of cataracts, which are now being removed by blasting of the rocks. Since 1838 there have been steamboats on the river, and the trade carried on by it is considerable.

Dniester (nēs'tẽr), a large river of Europe, which has its source in the Carpathian Mountains, in Austrian Galicia, enters Russia at Chotin, and empties itself into the Black Sea, after a course of about 750 mi. Its navigation is difficult on account of frequent shallows and rapids.

Doane, George Washington (1799–1859), American bishop, b. in New Jersey. He took a great interest in educational matters; taught in Trinity College, Hartford, and, in 1846, founded Burlington College.

Dobrud'sha, The, a territory forming part of the kingdom of Roumania, included between the Danube, which forms its boundary on the w. and n., the Black Sea on the e., and on the s. by a line stretching from Silistria to

a point a few miles s. of Mangalia. There are some fertile spots, but on the whole it is marshy and unhealthy. The population is of various nationalities, Roumanians, Bulgars, Greeks, Turks, and Jews. The inhabitants support themselves by rearing sheep and buffaloes. The principal town is Babadagh. Pop. about 100,000.

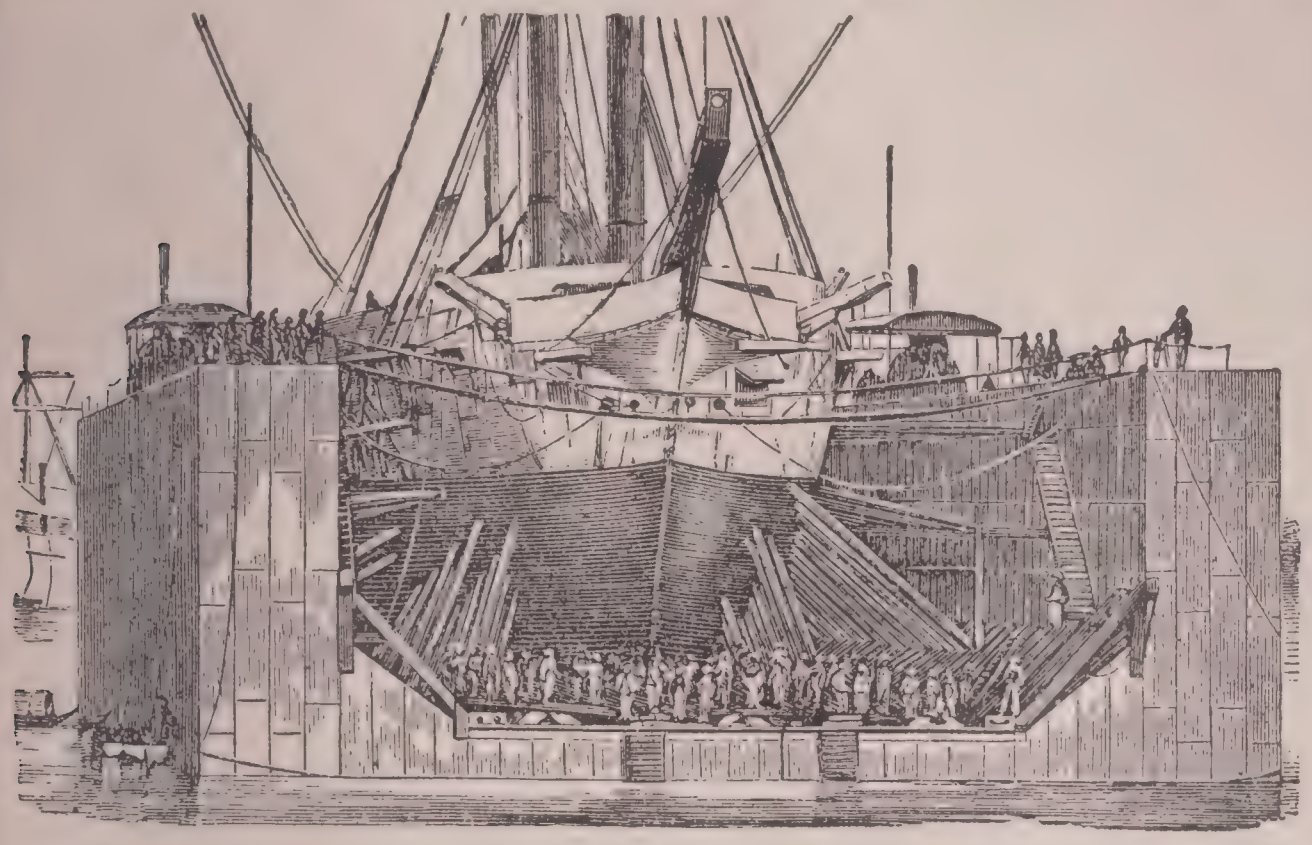
Dock, a name applied to different plants of the genus *Rumex*, belonging to the rhubarb family. These are large herbaceous plants, with stout roots, alternate and often entire leaves, and bearing panicles of small, greenish flowers. They are very troublesome as weeds, but the roots of some of them are used medicinally as astringents.

Docks are usually artificial enclosures for the reception of vessels, and provided with gates to keep in or shut out the tide. They are called *wet-docks* when they are intended to receive vessels for loading and unloading, the gates being in this case constructed so as to keep in the tide, and thus preserve the water within the docks as nearly as possible at the uniform level of high water. They are called *dry-docks*, or *graving-docks*, when they are intended to admit vessels to be examined and repaired, the gates in this case being such as to keep out the tide while the shipwrights are engaged on the vessel. There is another kind of dry-docks called *floating-docks*, which float on the surface of the water, and may be sunk sufficiently to allow of a vessel being floated into them, and then raised again, by pumping the water out of the tanks round the sides. One of the chief uses of a wet-dock is to keep a uniform level of water, so that the business of loading and unloading ships can be carried on without any interruption and without danger of damage to the vessel from straining, low tides, storms, etc.

Graving-docks are built of strong masonry, and their entrance is closed either by swinging gates opening in the middle, and when shut presenting a salient angle to the water in the river or harbor from which the dock is entered, or by a framework called a *caisson*, built like the hull of a ship, with a keel and a stem at both ends. When the caisson is empty it floats, and may be removed to admit of a vessel being floated into the dock. The caisson being then placed at the entrance and filled with water, again sinks into the grooves intended for it and closes the graving-dock. The water is then pumped out, leaving the ship dry and supported by wooden blocks and props. With regard to floating docks, a common type of construction is the iron floating-dock, built in water-tight compartments, and not closed in at either end. It is sunk to the required depth by the admission of water into so many of the compartments, till the vessel to be docked can float easily above its bottom, and it is then raised by pumping out the water until the ship can be propped up as in a dry-dock.

A kind of dry-dock, called the *hydraulic lift-dock*, consists of a double row of iron columns, each of which contains a hydraulic press. All

these hydraulic presses can be worked simultaneously by a powerful steam engine, and their combined action has the effect of raising a series of transverse iron girders stretching from the columns on one side to those of the other. An iron pontoon is first floated above these girders, and then sunk so as to rest on them,



Floating-dock.

and the ship to be docked is floated above the pontoon, and supported by blocks resting only upon the pontoon, so that the ship is in no way connected with the columns on each side. The hydraulic presses are then set to work, the girders with the pontoon and ship are raised high enough for the water to be run out of the pontoon, which is then sufficiently buoyant to float the ship. The pontoon may now be floated away clear of the dock, and another take its place. By this plan a number of vessels can be floated for overhauling and repairs in very shallow water and at comparatively slight expense.

Dock-yards, establishments supplied with all sorts of naval stores, materials and conveniences for the construction, repairs, and equipment of ships of war. In the U. S. there are nine important navy-yards, located at Brooklyn, N. Y.; Boston Mass.: Portsmouth, N. H.; League Island, Pa.; Portsmouth, Va.; Mare Island, Cal.; New London, Conn.; Pensacola, Fla.; and at Washington, D. C.

Doctrinaires, a section of French politicians, represented by the Duke de Broglie, Royer-Collard, Guizot and others who became prominent after the Restoration in 1815. They favored a constitutional monarchy with a balance of power similar to that which then existed in Britain. In the chambers they thus occupied a place between radicals and ultra-royalists. They received the name of *doctrinaires* because they were looked upon more as theoretical constitution-makers than practical politicians, and the term is now used to designate political theorists generally.

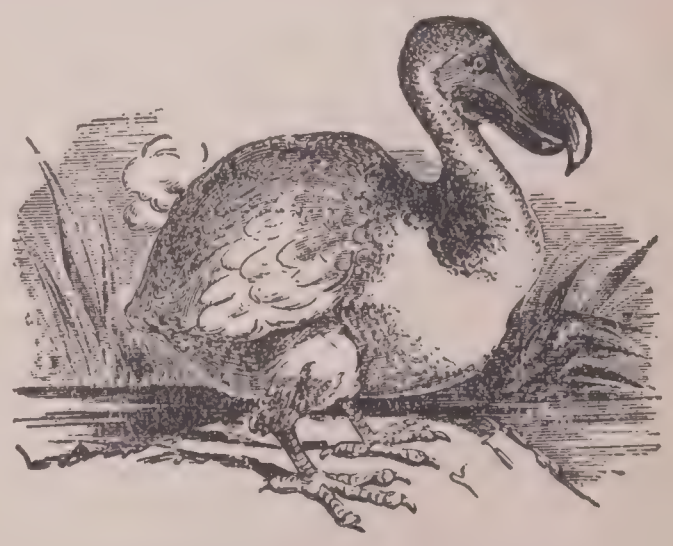
Dodge, Augustus Cæsar (1812–1883), b. in Missouri. He was one of the first U. S. senators from Iowa, sitting from 1848 to February, 1855, and was minister to Spain 1855–59. In 1873 he became mayor of Burlington.

Dodge, Grenville Mellen, b. in Danvers, Mass., April 12, 1831; served with distinction in the Civil War, and in December, 1864, succeeded General Rosecrans in command of the Department of Missouri. In 1866 he became chief engineer of the Union Pacific railroad, of which he has been many years a director. He served a term in Congress from Iowa, 1868–69.

Dodge, Henry (1782–1867), soldier, b. in Indiana. He fought in the Black Hawk War, and obtained a colonelcy in the regular army. In 1836 he was made governor of the territory of Wisconsin, and later served two terms as delegate in Congress. In 1846 he again became governor, and was U. S. senator from the state of Wisconsin from 1848 to 1857.

Dodge, Mary Mapes, b. in New York City in 1838; has written extensively for the magazines, and in 1873 became editor of *St. Nicholas.*

Dodo (*Didus Ineptus*), an extinct genus of birds once abundant on the Island of Mauritius, and assigned by naturalists to the order Columbæ, or pigeons, though an extreme modification of the type. It was a massive, clumsy



Supposed Figure of the Dodo.

bird, larger than a swan, covered with down instead of feathers, with short, ill-shaped legs, a strong, bulky, hooked beak, and wings and tail so short as to be useless for flight. Its extinction was due to its organization not being adapted to the new conditions which colonization and cultivation introduced.

Dodo'na, a celebrated locality of ancient Greece, in Epirus, where was one of the most ancient Greek oracles. It was a seat of Zeus, whose communications were announced to the priestesses in the rustling of the leaves on its oak-tree, and the murmuring of water which gushed forth from the earth.

Dog, a digitigrade, carnivorous animal, forming the type of the genus *Canis*, which includes also the wolf, the jackal, and, as a sub-genus, the fox. The origin of the dog is a much-debated question, some considering the breed derived from the wolf, an opinion which is based on resemblances of structure, the susceptibility which the wolf shows of being domesticated, the fact of the two animals breeding together and producing fertile young, and the equality in the period of gestation. But all these points are subject to exceptions and reservations which make the matter doubtful. It is generally agreed that no trace of the dog is to be found in a primitive state, the dhole of India, and dingo of Australia being believed to be wild descendants from domesticated ancestors. Several attempts to make a systematic classification of the varieties of dogs have been made but without much success, it being difficult in many cases to determine what are to be regarded as types, and what as merely mongrels and crossbreeds. Colonel Hamilton Smith divides dogs into six groups as follows: 1, *Wolf-dogs*, including the Newfoundland, Esquimaux, St. Bernard, shepherd's dog, etc.; 2, *Watch-dogs* and *Cattle-dogs*, including the German boar-hound, the Danish dog, the matin dog, etc.; 3, *Greyhounds*, the lurcher, Irish hound, etc.; 4, *Hounds*, the bloodhound, staghound, foxhound, setter, pointer, spaniel, cocker, poodle, etc.; 5, *Cur-dogs*, including the terrier and its allies; 6, *Mastiffs*, including the different kinds of mastiffs, bull-dog, pug-dog, etc. Dogs have in the upper jaw six incisors, two strong curved canines, and six molars on each side, the first three, which are small and have cutting edges, being called false molars; in the lower jaw are six incisors, two canines, and on each side seven molars. The forefeet have five toes, the hindfeet four or five; the claws are strong, blunt, and formed for digging, and are not retractile. The tail is generally long, and is curled upward. The female has six to ten mammæ; she goes with young nine weeks as a rule. The young are born blind, their eyes opening in ten or twelve days; their growth ceases at two years of age. The dog commonly lives about ten or twelve years, at the most, twenty.

Dogbane, an American plant found from Canada to Carolina, belonging to the natural order Apocynaceæ. The whole plant is milky; the root is intensely bitter and nauseous, and is employed in America instead of ipecacuanha. Another species yields a useful fiber, and is known as Canada or Indian hemp.

Dog days, the name applied by the ancients to a period of about forty days, the hottest season of the year, at the time of the heliacal rising of Sirius, the dog-star. The time of the

rising is now, owing to the precession of the equinoxes, different from what it was to the ancients (July 1); and the dog days are now counted from July 3 to August 11, that is, twenty days before and twenty days after the heliacal rising.

Doge (dōj), formerly the title of the first magistrates in the Italian republics of Venice and Genoa. The first doge of Venice elected for life was Paolo Anafesto, in 697; and in Genoa, Simon Boccanera, in 1339. In the former city the dignity was always held for life; in the latter, in later times, only for two years. In both cities the office was abolished by the French in 1797.

Dogfish, a name given to several species of small shark, common around the British Isles. The rough skin of one of the species, the lesser spotted dogfish, is used by joiners and other artificers in polishing various substances, particularly wood. This species is rarely 3 ft. long. *S. canicula*, the greater dog-

Lesser Spotted Dogfish.

fish, is in length from 3 to 5 ft. It is blackish brown in color, marked with numerous small dark spots. Both species are very voracious and destructive. Their flesh is hard, dry, and unpalatable. The common or picked dogfish is common in North American seas, aud is sometimes used as food. It is fierce and voracious.

Dogger-Bank, an extensive sand bank of the German Ocean, celebrated for its cod fishery. It commences about 36 mi. e. of Flamborough Head and extends e. n. e. to within 60 mi. of Jutland, in some places attaining a breadth of about 60 mi., though it terminates merely in a point. Where shallowest the water over it is 9 fathoms.

Dog lichen, the popular name of a plant, common on damp ground, stones, and trunks of trees. It was formerly supposed to be a specific for hydrophobia. Also known as *Ash-colored Ground Liverwort.*

Dogma, an article of religious belief, one of the doctrines of the Christian faith. The history of dogmas, as a branch of theology, exhibits in a historical way the origin and the changes of the various Christian systems of belief, showing what opinions were received by the various sects in different ages of Christianity, the sources of the different creeds, by

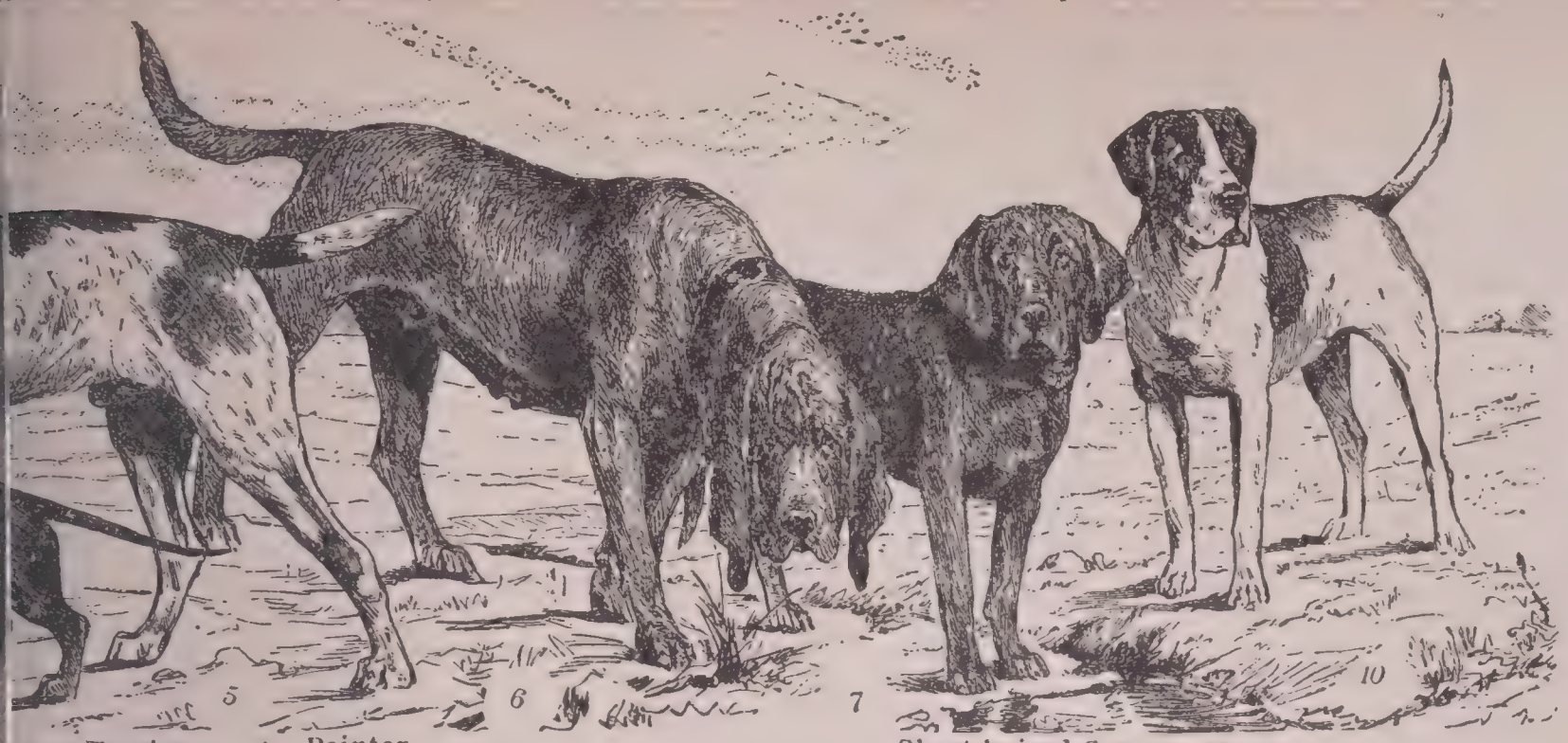
1. Setter, Long-haired English Hunter. 2. Quail Dog. 3. Short-haire

6. English Bloodhound. 7. Hanover B

8. German Tiger Dog. 9. Danish Dog. 11. Newfoundland Dog. 12. Tibe

13. String Poodle. 15. Eskimo Dog. 19. Shepherd Dog. 20. Pomeranian Dog. 21. Italian Gre

23.



og or Terrier. 4. Pointer.
10. English Fox Hunter.

5. Short-haired German Hunter.

4. Long-haired St Bernard.
ort-haired St. Bernard.

16. Bulldog. 17. Mastiff.
18. Dutch Mastiff or Pug Dog.

22. Smooth-haired Greyhound.
red Russian Greyhound.

24. Smooth-haired German Dwarf-pincher. 25. Monkey-pincher.

what arguments they were attacked and supported, what degrees of importance were attached to them in different ages, the circumstances by which they were affected, and the mode in which the dogmas were combined into systems. Lectures on this subject are common in the German universities.

Dog's Cabbage (Dog-cabbage), a smooth succulent herb, nat. order Chenopodiaceæ, found in the s. of Europe. Though it is slightly acrid and purgative it is sometimes used as a pot herb.

Dog's-tooth Ornament, an architectural ornament or molding consisting of square four-leaved flowers with projecting centers placed in close contact with each other. It is the characteristic decorated molding of early English architecture.

Dog's-tooth Violet, a liliaceous plant grown in gardens, so called from the appearance of its white bulbs.

Dogwatch, a nautical term distinguishing two watches of two hours each (4 to 6 P. M. and 6 to 8 P. M.). All the other watches count four hours each, and without the introduction of the dogwatches the same hours would always fall to be kept as watch by the same portion of the crew.

Dol'drums, among seamen, the parts of the ocean near the equator that abound in calms, squalls, and light baffling winds; otherwise known as the horse-latitudes.

Dol'ichos (-kos), a genus of leguminous plants, sub-order Papilionaceæ. They are found in the tropical and temperate regions of Asia, Africa, and America, and all produce edible legumes.

Dol'ichosaurus ("long lizard"), an extinct snake-like reptile found in the chalk, whose remains indicate a creature of aquatic habits from 2 to 3 ft. in length.

Dollar, a silver or gold coin of the U. S., of the value of 100 cents. The same name is also given to coins of the same general weight and value, though differing somewhat in different countries, current in Mexico, a great part of South America, Singapore, the Philippine Islands, etc. The name is from the Dutch (also Danish and Swedish) *daler*, from German *thaler*, so named from German *thal*, a dale, because first coined in Joachim's *Thal*, in Bohemia, in 1518.

Dollart, The, a gulf of the German Ocean, at the mouth of the Ems, between the Dutch province of Groningen and Hanover. It was originally dry land, and was formed by irruptions of the sea which took place in 1277 and 1530, overwhelming thirty-four large villages and numerous hamlets.

Döllinger (deul'ing-ėr), Johann Joseph Ignaz (1799–1890), a celebrated German theologian and leader of the Old Catholic party, was b. at Bamberg, in Bavaria. In 1822 he entered the church, and soon after published *The Doctrine of the Eucharist during the First Three Centuries*, a work which won him the position of lecturer on church history at the University of Munich. In later years he took an active part in the political struggles of the

time as representative of the university in the Bavarian Parliament, and as delegate at the Diet of Frankfort voted for the total separation of church and state.

Dolomite, a mineral, also called magnesian limestone. It is composed of carbonate of calcium and carbonate of magnesium, and varies from gray or yellowish-white to yellowish-brown. It abounds in the Apennines, Tyrol, Switzerland, Tuscany, North America, etc., and in England extends from South Shields to Nottingham. A variety called *bitter spar*, and sometimes *rhomb spar*, is found in crystals having the form of a rhomboid; color, grayish, yellowish, or reddish brown, easily scratched with the knife; semi-transparent. A second variety is denominated *pearl spar*, which has crystals of curvilinear faces and a pearly luster.

Dolomite Mountains (or Dolomite Alps), a group of European mountains belonging partly to Tyrol, partly to North Italy, and having the Piave and Rienz on the east, the Adige and Eisack on the west. They are named from the prevalence of the mineral dolomite, and present most interesting and picturesque scenery, the peaks being endlessly varied in form. The highest summits are Palle di San Martino (10,968 ft.); Sorapiss (10,798), and Monte Tofana (10,715).

Dolphin (*Delphinus*), a cetaceous animal forming the type of a family (Delphinidæ), which includes also the porpoises and narwhal. Dolphins are cosmopolite animals, inhabiting every sea from the equator to the poles; they are gregarious, and swim with extraordinary velocity. The common dolphin

Common Dolphin.

measures from 6 to 10 ft. in length, has a long, sharp snout with numerous nearly conical teeth in both jaws; its flesh is coarse, rank, and disagreeable, but is used by the Laplanders as food. It lives on fish, mollusca, etc., and often may be seen in numbers round shoals of herring. The animal has to come to the surface at short intervals to breathe. The blow-hole is of a semilunar form, with a kind of valvular apparatus, and opens on the vertex, nearly over the eyes. The structure of the ear renders the sense of hearing very acute, and the animal is observed to be attracted by regu-

lar or harmonious sounds. One or two young are produced by the female, who suckles and watches them with great care and anxiety, long after they have acquired considerable size. Compactness and strength are the characteristics of the genus. The name is also commonly but improperly given to a fish, a member of the mackerel family, the beauty of whose colors when dying has been much celebrated by poets. They abound within the tropics, are about 4 or 5 ft. long, very swift in swimming, and are used as food, though said sometimes to be poisonous.

Dome, a vaulted roof of spherical or other curvature, covering a building or part of it, and forming a common feature in Byzantine and also in Renaissance architecture. Cupola is also used as a synonym, or is applied to the interior, dome being applied to the exterior. Most modern domes are semi-elliptical in vertical section, and are constructed of timber: but the ancient domes were nearly hemispherical and constructed of stone. Of domes the finest, without any comparison, ancient or modern, is that of the Rotunda or Pantheon at Rome (142½ ft. internal diameter and 143 ft. internal height), erected under Augustus, and still perfect. Among others the most noteworthy are St. Sophia at Constantinople (104x201 ft.), the cathedral of Santa Maria del Fiore at Florence (139x310 ft.), St. Peter's at Rome (139x330 ft.), St. Paul's, London (112x215 ft.), the Hotel des Invalides (80x173 ft.), and the church of St. Geneviève at Paris (67x190 ft.) The figures represent the internal diameter and height in feet. The finest dome in the U. S. is that of the Capitol at Washington, built of cast-iron.

Domenichino (dō-men-i-kē′nō) (1581–1641), *Domenico Zampieri*, an Italian painter of great eminence, of the Lombard school, b. at Bologna. He studied under Annibal Carracci, and afterward went to Rome, where he became painter to Pope Gregory XV. Among his best works are the *Communion of St. Jerome* in the Vatican Museum, the *History of Apollo*, the *Martyrdom of St. Agnes*, and the *Triumph of David.*

Domin′go, San, capital of the Dominican Republic (or San Domingo) in the island of Hayti. It lies on the s.e. coast at the mouth of the Ozama, and has a commodious port. It is the oldest European city in the New World, having been founded in 1494 by Bartholomew Columbus. Pop. about 16,000.

Dominica (dom-i-nē′kȧ), a British West India island, so named because discovered by Columbus on a Sunday, a member of the united colony of the Leeward Islands between Martinique and Guadeloupe. It is about 29 mi. in length, n. to s. and 12 mi. in breadth e. to w; area 186,436 acres. It is rugged and mountainous, but it contains many fertile valleys and is well watered. The shores are but little indented, and are entirely without harbors, but on the west side there are several good anchorages and bays. The principal exports consist of sugar, molasses, cocoa, and lime-juice. The imports and exports amount each to about $250,000 annually. Dominica was ceded by France to Great Britain in 1763. Roseau is the capital. Pop. 28,211 (including about 300 aboriginal Caribs).

Domin′ical Letter, in chronology, properly called Sunday letter, one of the seven letters of the alphabet, A B C D E F G, used in almanacs, ephemerides, etc., to mark the first seven days of the year and all consecutive sets of seven days to the end of the year, so that the letter for Sunday will always be the same. If the number of days in the year were divisible by seven without remainder, then the year would constantly begin with the same day of the week; but as it is, the year begins and ends on the same day, and therefore the next year will begin on the day following, and on leap years two days following, so that the same series is not repeated till after four times seven, or twenty-eight years.

Dominican Republic (or San Domingo), a republic occupying the eastern portion of the island of Hayti; area 20,596 sq. mi. It is fertile and exports mahogany, sugar, tobacco, cocoa, etc., but its resources are as yet but little developed. It formerly belonged to Spain, and is the oldest colonial settlement in America. Its inhabitants are chiefly negroes and mulattoes. Capital, San Domingo. Pop. est. at 504,000. See *Hayti.*

Dom′inoes, a game played with small flat rectangular pieces of ivory, about twice as long as they are broad. They are marked with spots varying in number. When one player leads by laying down a domino, the next must follow by placing alongside of it another which has the same number of spots on one of its sides. Thus, if the first player lays down 6–4, the second may reply with 4–8, or 6–7, etc.; in the former case he must turn in the 4, placing it beside the 4 of the first domino, so that the numbers remaining out will be 6–8; in the latter case he must turn in the 6 to the 6 in like manner, leaving 4–7, to which his opponent must now respond. The player who cannot follow suit loses his turn, and the object of the game is to get rid of all the dominoes in hand, or to hold fewer spots than your opponent when the game is exhausted by neither being able to play.

Domitian (or in full, Titus Flavius Domitianus Augustus (A. D. 51–96), Roman emperor, son of Vespasian, and brother of Titus; in 81 succeeded to the throne. At first he ruled with a show of moderation and justice, but soon returned to the cruelty and excesses for which his youth had been notorious.

Domremy la Pucelle (don-rė-mi lȧ pu-sāl), the birthplace of Joan of Arc, a small French village, department of the Vosges, 7 mi. n. of Neufchâteau. The house is still shown here in which the heroine was b., and in the neighborhood is the monument erected to her memory.

Don (ancient *Tanais*), a river of Russia, which issues from Lake Ivan-Ozero, in the government of Tula, and flows s.e. through governments Riazan, Tambov, Voronej, and Don Cossacks, to within 37 mi. of the Volga, where it turns abruptly s.w. for 236 mi., and

falls into the Sea of Azof; whole course nearly 900 mi. The chief tributaries are: right bank, the Donetz and Voronej; left, the Khoper and Manitsch. Although not admitting vessels of much draught, the Don carries a large traffic especially during the spring floods, and a canal connects it with the Volga system of navigation. It has also very extensive and productive fisheries.

Dona'ti's Comet, so called from the Italian astronomer Donati, who first observed it in June, 1858. Next to the comet of 1811 it is the most brilliant that has appeared this century. It was nearest the earth on Oct. 10, 1858.

Donax, a species of grass or reed inhabiting the southern parts of Europe; it grows to a great height and is used for fishing-rods, etc.

Don'caster, town of England, West Riding of Yorkshire. It has manufactures of ropes, canvas, machinery, etc. It has been long celebrated for its annual races, now held in the middle of September. Doncaster was originally a Roman station on the line of the old Roman Watling Street. Pop. 25,938.

Dondrah Head, the southern extremity of the island of Ceylon. It was the site of the Singalese capital during part of the seventh century, numerous remains of which are still to be found.

Don'egal, a maritime county, Ireland, province of Ulster; area 1,197,154 acres. The fisheries are extensive and valuable, and form the chief employment of the inhabitants of the coast and islands. Grain, butter, and eggs are exported. The minerals include marble, lead, copper, etc., but are not wrought to advantage. Pop. 185,211. Donegal, the county town, is a small seaport on the bay of the same name, at the mouth of the river Esk. Pop. 1,416.

Dongola, a district of Upper Nubia, Egypt, on both sides of the Nile. It formerly belonged to Egypt and was the seat of a pasha, but since the evacuation of all the country south of Wada Halfa in 1886 by the Egyptian government, has been left in an unsettled state. Its chief products are dates, cotton, indigo, and maize. The population is a mixture of Arabians and indigenous Nubians. Its chief town is Dongola (or *El Ordeh*), on the left bank of the Nile. Pop. 6,000.

Doniphan, Alexander William (1808–1887), soldier, b. in Mason co., Ky. He graduated at Augusta College in 1824, was admitted to the bar in 1830, and began to practise in Lexington, Mo. He was elected to the legislature in 1836, 1840, and 1854. In 1838, when the state militia was summoned out against the Mormons, he commanded the first brigade, and captured Joseph Smith, who escaped, joined his band in Illinois, and afterward called Dr. Doniphan to act as his counsel. He was made colonel of a regiment of mounted veterans equipped for the army of the West, at the beginning of the War with Mexico in 1846. He was a commissioner from Missouri to the Peace Convention in Washington, which endeavored to avert the Civil War.

Donizet'ti, Gaetno (1798–1848), Italian composer. In 1835 he was appointed professor of counterpoint at the Royal College of Naples, but removed in 1840 to Paris, bringing with him three new operas, *Les Martyrs*, *La Favorita*, and *La Fille du Régiment*, of which the last two are among his most popular productions. Of his other operas none except *Linda di Chamouni* and *Don Pasquale* achieved any special triumph. He had written as many as sixty-four operas.

Don Juan (Sp. pron. *hụ-ân'*), the hero of a Spanish legend which seems to have had some historical basis in the history of a member of the noble family of Tenorio at Seville. According to the legend Don Juan was a libertine of the most reckless character. An insult to the daughter of a governor of Seville brought the indignant father and the profligate don into deadly conflict, in which the former was slain. Don Juan afterward, in a spirit of wild mockery, goes to the grave of the murdered man and invites the statue of him erected there to a revel. To the terror of Don Juan the "stony guest" actually appears at the table to bear him away to the infernal world. The legend has furnished the subject for many dramas and operas. The most famous of the latter is Mozart's *Don Giovanni* which has made the story familiar to everybody. Among the former are *Burlador de Sevilla* by Tellez, *Don Juan ou Le Festin de Pierre*, by Molière, and *The Libertine* by Shadwell. The *Don Juan* of Byron bears no relation to the old story but in name and in the libertine character of the hero.

Donnelly, Ignatius, b. in Philadelphia, Nov. 3, 1831, and studied law. In 1857 he went to Minnesota, became lieutenant governor in 1859, and Congressman from December, 1863, to March, 1869. He was state senator during 1874 to 1878. He wrote *An Essay on the Sonnets of Shakespeare*, *Cæsar's Column*, and *The Great Cryptogram*. He maintained that Bacon wrote the Shakespearian plays. Died Jan. 2, 1901

Don Quixote (Sp. pron. kē-*hō'* tā), the title of a famous romance by Cervantes. See *Cervantes*. The name of the hero, Don Quixote, is used as a synonym for foolish knight-errantry or extravagant generosity.

Doolittle, James Rood, b. in Washington co., N. Y., 1815; was admitted to the bar in 1837, and removed to Wisconsin in 1851. He became circuit judge in 1853, and from 1857 to 1869 was U. S. senator. He has since practised law in Chicago. In 1872 he presided at the Democratic convention in Baltimore, which endorsed Greeley for the presidency. D. 1897.

Doomsday (or Domesday) **Book,** a book containing a survey of all the lands in England, compiled in the reign and by the order of William the Conqueror. The survey was made by commissioners, who collected the information in each district from a sworn jury consisting of sheriffs, lords of manors, presbyters, bailiffs, villeins—all the classes, in short, interested in the matter. The extent, tenure, value, and proprietorship of the land in each district, the state of culture, and in some cases the number of tenants, villeins, serfs, etc., were the

matters chiefly recorded. The survey was completed within a year. Northumberland, Durham, Cumberland, and Westmoreland were not included in the survey, probably for the reason that William's authority was not then (1086) settled in those parts. The Domesday Book consists of two volumes, one folio and one quarto. It has been twice republished, the last time (1861–65) in perfect facsimiles of the original.

Dordogne (dor-dony), a department of France, which includes the greater part of the ancient province of Périgord, and small portions of Limousin, Angoumois, and Saintonge. Area 3,544 sq. m., of which about a third is fit for the plow. The chief minerals are iron, which is abundant, slate, limestone, marble, and other stone. Mining, iron manufacture, etc., are carried on to a considerable extent, and there are a number of vineyards. The climate is mild, but somewhat changeable. Pop. 492,205. The river DORDOGNE, principal river of the department, rises on the flanks of the Puy-de-Sancy, flows w.s.w., and after a course of 290 miles unites with the Garonne in forming the Gironde.

Doré (dō-rā) PAUL GUSTAVE (1833-1883), a prolific French draftsman and painter, b. at Strasbourg. He distinguished himself greatly as an illustrator of books. His illustrations of Rabelais, of Perrault's *Tales*, Sue's *Wandering Jew*, Dante's *Divina Commedia*, and Cervantes's *Don Quoixote*, displayed great fertility of invention, and the fine fantasy of his landscapes and the dramatic effectiveness of his groups acquired for him a European reputation.

Doria, one of the most powerful families of Genoa, became distinguished about the beginning of the twelfth century, and shared with three other leading families, the Fieshi, Grimaldi, and Spinola, the early government of the republic (1284–1560).

Dorians, one of the four great branches of the Greek nation who migrated from Thessaly southward, settling for a time in the mountainous district of Doris in Northern Greece and finally in Peloponnesus.

Doric Order, in architecture, is the oldest, strongest, and simplest of the three Grecian orders, and the one that is best represented among the remains of ancient Greek architecture. The Doric column is distinguished by its want of a base (in the more ancient examples, at least), by the small number of its flutings and by its massive proportions, the true Grecian Doric having the height of its pillars six times that of the diameter. The capital was small and simple, and the architrave, frieze, and cornice were rather plain and massive.

Dormant State, a state of torpidity in which certain animals pass a portion of the year. In cold and temperate climates this period of long sleep takes place during the winter months, and is properly called *hibernation*. It commences when the food of the animal begins to get scarce, continues for a longer or shorter period, and is deeper or lighter according to the habits and constitution of the animal.

Bats, bears, some animals of the rodent orde such as the porcupine, the dormouse, the squi rel, etc., all the animals belonging to th classes of Amphibia and Reptilia, such as to toises, lizards, snakes, frogs, etc., and ma species of molluscs and insects, hibernate mo or less completely, retiring to suitable plac of concealment—the bat to dark caves, th hedgehog to fern-brakes, snakes to holes i trees, etc. During hibernation there is a gre decrease of heat in the bodies of the anima The respiration as well as the pulsation of th heart is exceedingly slow, and the irritabili of the animal often so low that in some cas it can be awakened only by strong electri shocks. With frogs and amphibious reptil the dormant state is very common, and if th temperature is kept low by artificial mea they may remain dormant for years. Th term *æstivation* has been used to describe a sim lar condition into which certain animals, suc as serpents and crocodiles, in tropical cou tries pass during the hottest months of th year.

Dormouse, a genus of mammiferous quad rupeds, of the order Rodentia. These litt animals, which appear to be intermediate be tween the squirrels and the mice, inhabit tem perate and warm countries, and subsist entirel on vegetable food. Their pace is a kind o leap, but they have not the activity of squi

Dormouse.

rels. While feeding they sit upright and carry the food to their mouth with their paws. The dormice pass the winter in a lethargic or tor pid state, reviving only for a short time on a warm sunny day, when they take a little of their hoarded stores and then relapse into the dormant state. They bring forth three or four at a birth.

D'Orsay, ALFRED, COUNT (1798–1852), a dilettante artist and man of fashion. When a young man he visited England. He married a daughter of the Earl of Blessington, but after the earl's death, a separation took place, and D'Orsay became an inmate of the Gore House, which the Countess of Blessington had made the center of a famous literary coterie.

Dorsey, STEPHEN W., b. in Vt., Feb. 28, 1842; served during the Civil War. He went to Arkansas in the "carpet bag" times, and

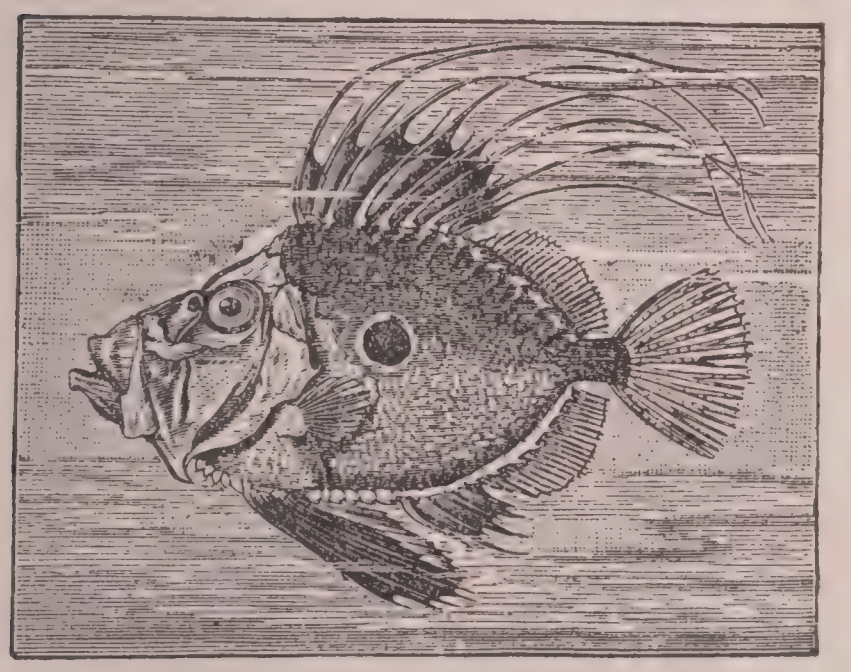
sat as U. S. senator from that state from 1873 to 1879.

Dorset, DORSETSHIRE, a maritime county in the south of England, area 627,265 acres. A great part of the county is grass, and dairy husbandry is extensively carried on. Neither coal nor ores of any kind are found, but the quarries yield the well-known Portland stone. Pipe clay, plastic clay, and potter's clay also abound. The principal manufactures are those of flax, canvas, duck, etc., also silk and woolens. Pop. 194,487.

Dort, (or Dordrecht), a town, Holland, province South Holland, 14 mi. n.e. Rotterdam, on the Merwede, an arm or part of the Maas, and on an island separated from the mainland by an inundation in 1421. It is an old town, with a fine Gothic church, a good townhouse, museum, etc. It was formerly of more importance than now, but it still carries on an extensive trade, being not only near the sea, but by the Rhine, the Maas, and other water communications, connected with an immense extent of land territory. Pop. 31,067.

Dort′mund, a city of Prussia, province of Westphalia, situated on the Ems, 47 mi.n.n.e.of Cologne. It has rapidly increased in recent years, its prosperity being due to its becoming the center of several important railway systems, to the opening of extensive coal mines in the vicinity, and to the active manufactures of iron, steel, machinery, railway plant, etc. There are also a number of breweries, potteries, tobacco factories, chemical works, etc. It was once a free imperial Hanseatic town, and the seat of the chief tribunal of the Vehme. Pop. 78,435.

Dory (or John Dory) (*Zeus faber*), a fish belonging to the mackerel family, celebrated for



John Dory.

the delicacy of its flesh. It seldom exceeds 18 in. in length, and is yellowish-green in color with a blackish spot on each side.

Dot′terel, a species of plover which breeds in the north of Europe, and returns to the south for the winter. In Scotland it appears in April and leaves in August, the young being hatched in July. It is found all over Europe and Northern Asia. Several species are

represented in the U. S., including the golden plover, the kill-deer, and piping plover.

Dotterel.

Douai (dö′ā) (or Douay), a town in France, department Nord, on the Scarpe, 18 mi. s. of Lille. It is one of the oldest towns in France, of which it became a part by the Treaty of Utrecht. It is strongly fortified, has a fine townhouse, several handsome churches, an academy of arts and law, a lyceum, museum and public library, Benedictine college, hospital, etc.; a cannon foundry, linen manufactories, machine works, tanneries, etc. Pop. 30,030.

Douai Bible, the English translation of the Bible used among English-speaking Catholics, and executed by divines connected with the English College at Douai. The New Testament was published in 1582 at Rheims, the Old in 1609–10 at Douai, the translation being based on the Vulgate. Various revisions have since materially altered it.

Double-eagle, an American gold coin of the value of 20 dollars, so called because double the value of the coin called the eagle.

Double-stars (or Binary Stars), stars which are so close together that they appear as one to the naked eye, but are seen to be double when viewed through a telescope. One of these stars may revolve about the other, or both may revolve round a common center.

Doubs (dö), a department of France, having Switzerland on its eastern frontier. Its surface is traversed by four chains of the Jura. The temperature is variable, and the climate somewhat rigorous. About a third of the land is arable, but much the greater part is covered with forests. Maize, potatoes, hemp, flax, are the principal crops. Much dairy produce is made into Gruyère cheese. The minerals include iron, lead, and marble. Pop. 310,963.

Douglas (dug′las), capital of the Isle of Man, is frequented by immense numbers of visitors during the summer. Among the objects of interest are the House of Keys, the custom-house, the extensive breakwater, the promenade, etc. Pop. 15,500.

Douglas (dug′las), a family distinguished in the annals of Scotland. Their origin is unknown. They were already territorial magnates at the time when Bruce and Baliol were competitors for he crown. As their estates

lay on the borders they early became guardians of the kingdom against the encroachments of the English.

Douglass, FREDERICK (1817–1895), American lecturer and journalist, was the son of a negro slave, and was b. at Tuckahoe in Maryland. Although his father was a white man, he was, according to the law, reared as a slave. In 1832 he was purchased by a Baltimore shipbuilder, but made his escape in 1838. As he had taught himself to read and write, and showed talent as an orator, he was employed by the Anti-slavery Society as one of their lecturers. In 1845 he published his autobiography, and afterward made a successful lecturing tour in England. In 1870 he started a journal entitled *The New National Era;* in 1871 he was appointed secretary of the commission to Santo Domingo; in 1872, presidential elector; in 1877, marshal for the District of Columbia; recorder of deeds for that district, 1881–86; and U. S. Minister to Hayti in 1890.

Douglas, STEPHEN ARNOLD (1813–1861), American statesman, b. in Vermont. He was appointed attorney general for the state of Illinois, and in 1843 elected a member of the House of Representatives. In 1847 he was member of the Senate, and by re-election was a member of this body till his death. He was especially prominent in connection with the question as to the extension of slavery into new states and territories, which he maintained was a matter to be settled by the people of the respective states or territories, and not by Congress. He was a presidential candidate in 1860, when Lincoln was elected.

Doum Palm (döm), a palm tree. It is remarkable, like the other species of the genus, for having a repeatedly-branched stem. Each branch terminates in a tuft of large fan-shaped leaves. The fruit is about the size of an apple; it has a fibrous mealy rind, which tastes like gingerbread, and is eaten by the poorer inhabitants of Upper Egypt, where it grows.

Douro (dö′rō) (or Duero), one of the largest rivers of the Spanish Peninsula, which, flowing west, traverses about one half of Spain and the whole of Portugal, and, after a course of 500 mi., falls into the Atlantic three miles below Oporto. It is navigable for small vessels for about 70 mi.

Do′ver, a borough of England, county Kent, 67 mi. s.e. of London. It lies on the coast of the Strait of Dover, and is 21 mi. distant from Calais on the French coast. It is an important railway terminus, and as a port for mail and packet service with the Continent has a large passenger traffic. Shipbuilding, sail making, and fisheries are the chief industries. The harbor has been much improved in recent years. The entrance is protected by the Admiralty Pier, which is nearly half a mile in length. The celebrated castle of Dover stands on a chalk cliff 350 feet in height. Pop. 33,678.

Dover, Kent co., Del. Railroad, Phil., Wil. & Balt. Industries: Canning and glass button factories. Dover is the capital of the state and is the center of a fruit growing region. Pop. 1900, 3,329.

Dover, Strafford co., N. H., on the Cocheco River. Railroads: Boston & Maine; Dover & Portsmouth; and Dover & Winnipiscogee. Industries: Cotton and woolen manufacturies, print works, boot and shoe shops. Pop. 1900, 13,207.

Dover, STRAITS OF, the narrow channel between Dover and Calais which separates Great Britain from the French coast. At the narrowest part it is only 21 mi. wide. The depth of the channel at a medium in the highest spring tides is about 25 fathoms. On both the French and English sides the chalky cliffs show a correspondency of strata which leaves no room for doubt that they were once united.

Dow (or Douw, properly Dou), GERARD (1613–1675), an eminent painter of the Dutch school, was the son of a glazier, and b. at Leyden. He studied under Rembrandt, and united his master's manner in chiaroscuro with the most minute finish and delicacy.

Dow, NEAL, temperance reformer, b. in Portland, Me., March 20, 1804. In 1880 he was the candidate of the National Prohibition party for president of the U. S. D. in 1897.

Down, a county of Ireland, in Ulster. Area 610,730 acres. Agriculture is comparatively advanced, oats, wheat, flax, and potatoes being the principal crops. The native breed of sheep is small, but valued for the delicacy of its mutton and the fine texture of its wool. The principal manufactures are linen and muslin. The fisheries on the coast, principally cod, haddock, and herring, are considerable. The county town is Downpatrick; others are Newtonards and Banbridge. Pop. 266,893.

Doyle, A. CONAN, b. 1859. English writer. Graduated at Stonyhurst College and shortly after made a trip to the Arctic regions. Later he practised medicine at South Sea, in the meantime doing some literary work. Among his more important novels are, *A Study in Scarlet*, *Firm of Girdlestone*, *Micah Clarke*, etc. Dr. Doyle has lectured successfully in the U. S.

Drachma (drak′ma), the unit of weight and of money among the ancient Greeks. It was the principal Greek coin, was made of silver, and was worth about 19½ cts. As a weight among the Greeks it was about 2 pwt. 7 grains troy.

Drag′on, a fabulous monster, the stories regarding which reach back almost as far as history. His form is described as generally resembling that of a winged and two-legged serpent, the body covered with scales, the head crested, and the mouth spouting fire. The immediate source of the mediæval conception is probably the Scriptures, modified by accounts brought home by the Crusaders of the crocodiles in Egypt.

Dragon (or dragon-lizard), a name for several species of lizards inhabiting Asia, Africa, and South America. The common flying lizard, the best type of the genus, is about 10 or 12 inches in length, the tail being extremely long in proportion to the body. The sides are furnished with peculiar extensions of the skin, forming a kind of wings, which help

to support it in the air when it springs from branch to branch. Its food consists almost exclusively of insects.

Fringed Dragon.

Dragon Fly, a family of neuropterous insects. They have a large head, large eyes, and strong horny mandibles. They are beautiful in form and color, and are of very powerful flight. The great dragon fly is about 4 in. long, and the largest of the British species. They live on insects, and are remarkable for their voracity. The dragon fly deposits its eggs in the water, where the larvæ and pupæ live on aquatic insects. The larval stage lasts for a year. The

Dragon Fly and Nymph.

family is of very wide distribution. The small blue *Agrion* is a common European form. In the U. S. the dragon fly is known as the devil's darning-needle.

Dragon's Blood, a resinous juice, usually obtained by incision from various tropical plants. It differs in composition, and is often much adulterated. It is opaque, of a reddish-brown color, brittle, and has a smooth, shining, conchoidal fracture. It is soluble in alcohol and oil, but scarcely so in water. It is used for coloring varnishes, staining marble, leather, and wood, for tooth tinctures, etc.

Dragon Tree, a tree-like liliaceous plant, with a stem simple or divided at top, and in old age often much branched. It is a native of the Canaries, and yields the resin known as dragon's blood. It is often grown in stoves and greenhouses.

Dragon Tree.

Drainage Tubes are used in surgery to effect a discharge of matter from an abscess or other collection of matter when a free incision cannot be safely or conveniently made. They are usually made of india rubber or caoutchouc, and are introduced into the abscess or wound so that one end is in contact with the seat of discharge, while the other reaches to the surface of the skin.

Draining, in agriculture, a method of improving the soil by withdrawing the water from it by means of channels that are generally covered over. The successful practise of draining in a great measure depends on a proper knowledge of the superficial strata, of their situation, relative degrees of porosity, etc. Some strata allow water to pass through them, while others more impervious force it to run or filtrate along their surfaces till it reaches more level ground below. In general where the grounds are in a great measure flat and the soils of materials which retain the excess of moisture, they require artificial means of drainage to render them capable of yielding good crops whether of grain or grass. The wetness of land which makes it inferior for agricultural purposes, may appear not only as surface water but as water which flows through the lower strata, and to draw off these there are the two distinct operations of surface-draining and under-draining. The rudest form of open drains are the deep furrows lying between high-backed ridges, and meant to carry off the surplus water after the soil is completely saturated, but in doing so they generally carry off also much of the best of the soil and of the manure which has been spread upon it. The ordinary ditch is a common form of water-course useful in certain cases, as in hill pastures. But covered drains at a depth of 4 ft. or so are the common forms in draining agricultural lands. They are gen-

erally either *stone-drains* or *tile-drains*. Stone-drains are either formed on the plan of open culverts of various forms, or of small stones in sufficient quantity to permit a free and speedy filtration of the water through them. The box-drain, for instance, is formed of flat stones neatly arranged in the bottom of the trench, the whole forming an open tube. In tile-drains, tiles or pipes of burnt clay are used for forming the conduits. They possess all the qualities which are required in the formation of drains, affording a free ingress to water, while they effectually exclude vermin, earth, and other injurious substances. Drainage tiles and pipes have been made in a great variety of forms, the earliest of which, since the introduction of thorough draining, was the horse-shoe tile, so called from its shape. These should always rest on soles, or flats of burned clay. Pipe tiles, which combine the sole and cover in one piece, have been made of various shapes, but the best form appears to be the cylinder. An important department of draining is the draining off of the waters which are the sources of springs. Sometimes the judicious application of a few simple drains, made to communicate with the watery layers, will often dry swamps of great extent where large sums of money, expended in forming open drains in the swamp itself, would leave it but little improved. In the laying out of drains the first point to be determined is the place of outfall, which should always afford a free and clear outlet to the drains, and must necessarily be at the lowest point of the land to be drained. The next point to be determined is the position of the minor drains; in the laying out of which the surface of each field must be regarded as being made up of one or more planes, as the case may be, for each of which the drains should be laid out separately. Level lines are to be set out a little below the upper edge of each of these planes, and the drains must then be made to cross these lines at right angles. By this means the drains will run in the line of the greatest slope, no matter how distorted the surface of the field may be. All the minor drains should be made to discharge into mains or submains, and not directly into an open ditch or water-course. As a general rule there should be a main to receive the waters of the minor drains from every five acres. The advantages of drainage are obvious. In the first place it allows the soil to be brought into a more suitable condition for the growth of plants, aiding in producing the finely divided and porous state by which the roots and rootlets can spread themselves at will in order to obtain the needed supplies of food, air, and moisture. It also allows the sun's rays to produce their full effect on the soil and plants without being robbed of great part of it by the stagnant water.

Drake, Sir Francis (1539–1596), an English navigator, b. at Tavistock, in Devonshire. He served as a sailor in a coasting vessel, and afterward joined Sir John Hawkins in his last expedition against the Spaniards (1567), losing nearly all he possessed in that unfortunate enterprise. On the most famous of his voyages Drake passed the Straits of Magellan, plundered all along the coasts of Chile and Peru, sacked several ports, and captured a galleon laden with silver, gold, jewels, etc., to the value of perhaps $1,000,000. He then ran north, seeking a passage to the Atlantic, but was compelled to return to San Francisco on account of the cold. He then steered for the Moluccas, and holding straight across the Indian Ocean doubled the Cape of Good Hope, and arrived at Plymouth, Nov. 3, 1580, being thus the first of the English circumnavigators.

Drake, Joseph Rodman (1795–1820), poet, b. in New York City. At first he was placed to serve in business, but soon abandoned merchandise for the study of medicine. In 1812 he became connected with Fitz-Greene Halleck. His most aspiring poem, *The Culprit Fay*, was written in his twenty-second year.

Drake, Samuel Gardner (1798–1875), antiquary, b. in Pittsfield, N. H. He was educated at the public school, and at the age of twenty he became a public school teacher. In 1828 he opened the first antiquarian bookstore in the U. S. He was a founder of the New England Historical and Genealogical Society. He edited some New England works, and published many books of historical and antiquarian subjects.

Drakenberg Mountains, a range of South Africa forming the western frontier of Natal, and rising to the height of 9,000 ft., a continuation of the Quathlamba Range.

Drama (Gr., from *drao*, "I act"), a class of writings which almost entirely consist of dialogue, persons being represented as acting and speaking, and the pieces being usually intended to be acted on the stage by parties assuming the characters of the respective persons. Its two great branches are tragedy and comedy, the former, roughly speaking, melancholy in character, the latter cheerful. The origin of the drama must be sought for in the love of imitation, and dramatic performances of some kind are to be met with probably among all nations. Dramatic compositions are found in the Old Testament, for example in Job and the Song of Solomon; and ancient India and China both developed a dramatic literature of their own. The European drama had its origin in Greece. Both forms, tragic and comic, took their rise in the celebrations of the Greek festivals of Dionysus (Bacchus), at which hymns and chants were sung by choruses in honor of the god, and the chorus continued to be a prominent feature of the old Greek drama. Greek comedy commenced about 580–560 B. C. with Susarion, but it was long in attaining regular form. Of the old Greek comedy the chief representatives were Cratinus, Eupolis, Pherecrates, and Aristophanes—the last the greatest. The invention of tragedy is generally ascribed to Thespis about 530 B. C., who was followed by Phrynicus. But the true creator of tragedy was Æschylus, in whose works and those of Sophocles and Euripides it found its most perfect expression. Thespis had only one actor, who from time to

e relieved the chorus by declamation. hylus changed this representation into real on by making use of two actors in addi- to the chorus. Æschylus also introduced ks; and by means of a long gown and the *urnus*, or buskin, the lofty stature of the es was imitated. A third actor was first oduced by Sophocles. The accommoda- s for the spectators were improved, and hinery and scenery introduced. The thea- which had been formerly built of wood, now large stone erections capable of con- ing the greater number of citizens. The lar drama among the Romans was bor- ed from the Greeks. Plautus and Terence imitators of the Greek comedy, Livius ronicus (240 B. C.) of the Greek tragedy. he Roman tragedy, the dramas of Seneca he only specimens extant. In most mod- European countries the regular drama its rise in the mysteries, miracle-plays, moralities of the Middle Ages. In Italy, ever, it began with a reproduction in Latin lassical models. The earliest tragedy in an is Trissino's *Sofonisba* (1502). Regular edies in Italian were written by Ariosto, ino, Macchiavelli, and others; and to the period (fifteenth and sixteenth centuries) ngs the Italian Pastoral Drama, which ng from the ancient idylls, and aimed at a iful delineation of Arcadian and mytho- al scenes. Among the pastoral dramatists is period are Poliziano, Tasso, and Guar-

The pastorals gave birth to the *opera*, masters of which, so far as it may be in- ed in the poetic drama, are Zeno and stasio. The Italian drama waned in the nteenth century, but in the eighteenth ine comedy and classic tragedy were re- d, the former by Goldoni, the latter by ri. Monti, Manzoni, and Niccolini are ng the later writers of tragedy.

e other European nations cultivated the natic art much later than the Italians. English and Spaniards devoted their atten- to it almost at the same time; the former hing their acme in Shakespeare, the latter ope de Vega and Calderon. The history e English theater and drama is naturally led into two parts, the first of which be- with the reign of Elizabeth and ends with eign of Charles I. The rapid development he drama during the reign of Elizabeth entirely unhampered by foreign influence. , Peele, Greene, Marlowe, Shakespeare, Jonson, Beaumont and Fletcher, Chap- , Webster, Middleton, Marston, Ford, and singer are among the chief names con- ed with the brilliant period of the English na. During the Commonwealth the Puri- prohibited all kinds of plays, and the ters were shut up for thirteen years. With rles II the drama reappeared, and exhib- a licentiousness hardly equaled by that ny other Christian nation. Among the f names belonging to this period are Dry- Otway, Lee, Shadwell, Wycherley, and erege. From the close of the seventeenth hat of the eighteenth century British

comedy was cultivated with much success by Cibber, Farquhar, Congreve, Sheridan, and others. During the nineteenth century many writers have been conspicuous by their dramas. Among the chief of these may be noted Byron, Coleridge, Landor, Shelley, Maturin, Talfourd, Milman, Sir Henry Taylor, the first Lord Lytton, Knowles, R. H. Horne, Arnold, Browning, Swinburne, and Tennyson.

The French drama was in a miserable state before Corneille (1606–84), who indeed is looked on as the founder of the drama in France. Racine, Molière, Voltaire, and in later times Hugo, are some of the other distinguished French dramatists. Since about 1820, a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the *classic*, approaches more and more to the German or British, or what is called the romantic school. The establishment of this school formed part of the general reaction against the excessive adherence to classic models in literature; the leader in the movement being Victor Hugo. C. Delavigne marks the transition from the classical to the beginnings of the romantic school, and among the modern dramatists may be mentioned A. de Vigny, George Sand, A. de Musset, Mérimée, Ponsard, Augier, Scribe, Dumas the Younger, and Sardou.

The German drama is of later birth than any we have mentioned, and for a long time the Germans contented themselves with translations and adaptations from the French. Lessing was the first who, by word and deed, broke the French sway (1755), and he was succeeded by Schiller and Goethe, who rank as the greatest of the more modern dramatists. Prominent names in the German drama are Kotzebue, Körner, Schlegel, Tieck, Brentano, Grillparzer, Hebbel, Ludwig, Gutzkow, Freytag, Laube, Von Moser, etc. The Dutch drama begins with the classical tragedies of Koster in the beginning of the seventeenth century, and reached its highest in Vondel (1587–1659). Holberg, Heiberg, Oehlenschläger, Ibsen, and Björnson are the chief names connected with the Scandinavian drama.

The various classes of drama—tragedy, comedy, opera, pastoral, burlesque, farce, etc. —are noticed under their proper headings, but there are numerous varieties and modifications in the modern drama which defy classification.

Draper, JOHN WILLIAM (1811–1882), chemist and physiologist. He made many contributions to scientific literature, and devoted much attention to the chemical action of light, in connection with which he effected some discoveries. Among his chief works is his *History of the Intellectual Development of Europe.*

Draper, WILLIAM F., was b. in Lowell, Mass., 1842, where he still lives. His early education was intended to fit him for entrance to Harvard University, but before matriculation he decided to spend some time in the shops owned by his father, who was a manufacturer of cotton machinery, and before the time had passed the war broke out and he left for the front.

After four years' campaigning, during which he was twice wounded and was brevetted brigadier general, was discharged in 1864, and took up the same business as his father. He was a member of General Long's staff, was a delegate to the convention that nominated Hayes, as an elector at large he voted for Harrison, and was chairman of the committee on resolutions in the Republican state convention in 1887. He was a member of the Fifty-third Congress. He was minister to Italy 1897–99.

Drave (or Drau) (drä′ve, drou), a European river which rises in Tyrol, flows e.s.e. across the north of Illyria and the south of Styria, and between Hungary on the left and Croatia and Slavonia on the right, and after a course of nearly 400 mi. joins the Danube 14 mi. east of Essek. It is navigable for about 200 mi.

Dravid′ian, a term applied to the vernacular tongues of the great majority of the inhabitants of Southern India, and to the people themselves who must have inhabited India previous to the advent of the Aryans. The Dravidian languages are generally considered to belong to the Turanian class, and the family consists of the Tamil, Telugu, Canarese, Malayâlam, Tulu, Tuda, Gond, Rajmahal, Oraon, etc. Only the first four mentioned have a literature, that of the Tamil being the oldest and most important.

Drawbridge, a bridge with a lifting floor, such as were formerly used for crossing the ditches of fortresses, or any movable bridge over a navigable channel where the height of the roadway is insufficient to allow vessels to pass underneath. Modern drawbridges across rivers, canals, the entrances of docks, etc., are generally made to open horizontally, and the movable portion is called a bascule, balance, or lifting bridge, a turning, swivel, or swing bridge, or a rolling bridge, in accordance with the mode in which it is made to open. Swing-bridges are usually divided into two parts meeting in the middle, and each moved on pivots on the opposite sides of the channel, or they may move as a whole on a pivot in the middle of the channel. Rolling bridges are suspended from a structure high above the water, and are propelled backwards and forwards by means of rollers.

Drawing is the art of representing upon a flat surface the forms of objects, and their positions and relations to each other. The idea of nearness or distance is given by the aid of perspective, foreshortening, and gradation. The term drawing, in its strict sense, is only applicable to the representing of the forms of objects in outline, with the shading necessary to develop roundness or *modeling.* In art, however, the term has a wider significance. Highly finished paintings in water color are called *drawings,* as are also sketches or studies in oils. Drawing, in its restricted sense, may be divided into these kinds: 1, *pen drawing;* 2, *chalk drawing,* which may include lead-pencil drawing; 3, *crayon drawing;* 4, *drawing shaded with the brush or hair pencil;* 5, *architectural or mechanical drawing. Pen drawings* are often confined to pure outlines; an appearance of *relief* or projection being given by thickening or doubling the lines on the shadow side. *Finished* pen drawings have all the shading produced by combinations of lines. *Chalk drawing* (including lead-pencil drawings) are most suited for beginners, as errors can be easily corrected. Black, red, and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity. A combination of hatching and stumping is generally preferable to adhering exclusively to either mode. *Crayon drawings* are those in which the true colors of the objects represented are more or less completely wrought out with different colored crayons. *Drawings shaded with the brush* are outlined with the pencil or pen, the shading being laid on or *washed in* with the brush in tints of India ink, sepia, or color. *Architectural and mechanical drawings* are those in which the proportions of a building, machine, etc., are accurately set out for the guidance of the constructor; objects are in general delineated by geometric or orthographic projection. The great schools of painting differ from one another as much in their drawing as in their painting. In Italy the Roman school, through Raphael's fine sense for the beautiful and expressive in form, and through his study of the antique, became the true teacher of beautiful drawing. The Florentine school tried to surpass the Roman precisely in this particular, but it lost by exaggeration what it had gained by learning and a close study of anatomy. In the Lombard school a tender style of drawing is seen through harmonious coloring, and in the Venetian school the drawing is often veiled in the richness of the color. The Dutch school excels in a careful and minute style of naturalistic drawing, combined with great excellence in coloring. The French school in the time of Poussin was very accurate in its drawing; at a later period its style betrayed a great amount of mannerism. David introduced again a purer taste in drawing and a close study of the antique, and these are qualities which distinguish his school (the so-called classical school) from the romantic and eclectic schools of a later period.

Dreams, trains of ideas which present themselves to the mind during sleep. The principal feature of the state of dreaming is the absence of voluntary control over the current of thought, so that the principle of suggestion has unlimited sway. There is usually an utter want of coherency in the images that appear before the mental eye, but this want excites no surprise in the dreamer. Occasionally, however, intellectual efforts are made during sleep which would be difficult to surpass in the waking state. It is said that Condillac often brought to a conclusion in his dreams reasonings on which he had been employed during the day; and that Franklin believed that he had been often instructed in his dreams concerning the issue of events which at that time occupied his mind. Coleridge composed from 200 to 300 lines during a dream; the

beautiful fragment of *Kubla Khan*, which was all he got committed to paper when he awoke, remains a specimen of that dream poem. Dreams are subjective phenomena dependent on natural causes.

Dredging, a term applied to the operation of removing mud, silt, and other deposits from the bottom of harbors, canals, rivers, docks, etc. The most simple dredging apparatus is the spoon apparatus, which consists of a strong iron ring or hoop, properly formed for making an impression upon the soft matter at the bottom, so as to scoop it into a large, leather bag attached to the ring and perforated with a number of small holes. The means for working it is a long handle, a suspending rope, and a crane or sweep-pole planted in a boat. Much more effective is the steam dredging machine now in common use. It has a succession of strong iron buckets on an endless chain, which traverses on a frame whose lower end is vertically adjustable so as to regulate the depth at which it works. It is worked by steam, and the buckets tear up the matter at the bottom, raise it, and discharge it into punts or hoppers stationed close to the dredging vessel. Dredging is also the operation of dragging the bottom of the sea in order to bring up oysters, or to procure shells, plants, and other objects for scientific observation. The oyster dredge is a light, iron frame with a scraper like a narrow hoe on one side, and a suspending apparatus on the other. To the frame is attached a bag made of some kind of netting to receive the oysters. The dredges used by naturalists are mostly modifications of the oyster dredge.

Dred Scott Decision.—This decision of the U. S. Supreme Court, delivered by Chief Justice Taney, March 6, 1856, awakened intense interest. The plaintiff, Dred Scott, was a slave in Missouri; his owner took him to Illinois, and also Minnesota, then a territory, both free soil, where he kept him for years, afterward moving back to Missouri, a slave state. The plea of Scott was that his residence in Illinois and Minnesota made him a free man. The decision was that he was a chattel, "without rights or privileges except such as those who held the power and the government might choose to grant him." The decision nationalized slavery by degrading the slave to the level of a horse or a plow, and overrode every sentiment of humanity respecting him.

Drenthe (dren'te), a province, Holland. Area 948 sq. mi. The soil is generally poor and the surface largely consists of heath and morass, but the province is famed for its horses and cattle. Drenthe is remarkable for the great number of so-called "giants graves" or barrows scattered over the country. Its capital is Assen. Pop. 125,792.

Dres'den, the capital of the kingdom of Saxony, on the river Elbe. It is first mentioned in history in 1206 and has been the residence of the sovereigns since 1485; was greatly extended and embellished by Augustus the Strong (1694–1736), and has rapidly increased during the nineteenth century. Among the chief edifices beside several of the churches are the Museum (joined on to an older range of buildings called the Zwinger), a beautiful building containing a famous picture gallery and other treasures; the Japanese Palace (Augusteum), containing the royal library of from 300,000 to 400,000 volumes, beside a rich collection of manuscripts; the Johanneum, containing the collection of porcelain and the historical museum, a valuable collection of arms, armor, domestic utensils, etc., belonging to the Middle Ages. The royal palace is unattractive externally, but has a fine interior. It contains (in what is called the Green Vault) a valuable collection of curiosities, jewels, trinkets, and works of art. The theater is one of the finest structures of the kind in the world. The city is distinguished for its excellent educational, literary, and artistic institutions, among which are the Polytechnic School, much on the plan and scale of a university; the Conservatory and School of Music; the Academy of Fine Arts, etc. The manufactures are not unimportant, and are various in character; the china, however, for which the city is famed, is made chiefly at Meissen, fourteen miles distant. The chief glory of Dresden is the gallery of pictures, one of the finest in the world, which first became of importance under Augustus II, king of Poland and elector of Saxony, but owes its most valuable treasures to Augustus III, who purchased the greater portion of the gallery of the Duke of Modena for $900,000. The pictures number about 25,000. Besides this fine collection the museum contains also engravings and drawings amounting to upwards of 350,000. There is here also a rich collection of casts exemplifying the progress of sculpture from the earliest times, and including copies of all the most important antiques. Dresden being thus rich in treasures of art, and favored by a beautiful, natural situation, is the summer resort of many foreigners. It suffered severely in the Thirty Years' War, and also in 1813 when it was the headquarters of Napoleon's army. It was occupied by the Prussians in 1866 but was evacuated in the following spring. Pop. 276,085.

Dresden, Battle of, a battle fought in 1813 between the French under Napoleon and the allies under Schwarzenberg. Napoleon had come to the relief of the city, which was occupied by the French. The allies assaulted and bombarded the city, and soon after a great pitched battle was fought (August 27), the allies being defeated.

Dresden China, a delicate, semi-transparent, highly finished china made at Meissen, near Dresden. The manufacture resulted from an accidental discovery made by Böttger, a young chemist, in 1710, and the vases, statuettes, groups of figures, candelabra, clocks, etc., manufactured during the eighteenth century are highly prized. They are more remarkable for excellence of execution than for purity of design.

Drew, John (1825–1862), American actor, b. at Dublin, Ireland. He came to the U. S. when a boy and appeared on the stage in New York City in 1845. Later he went to Philadel-

phia and became a favorite. In 1855 he became manager of the Arch street theater in company with William Wheatly. He toured England in 1855, California in 1858, and Australia in 1859.

Drew, JOHN, American actor, son of John Drew and Mrs. John (Louisa) Drew, b. in 1853 in Philadelphia. He first appeared in that city in 1872. Three years later he went to New York and took the part of *Bob Ruggles* in the *Big Bonanza* in the Fifth Avenue Theater. Later he appeared with Edwin Booth in Shakespearean plays, and was afterward connected with the Daly Theater where he remained until 1892. In that year he commenced starring on his own account.

Drexel, ANTHONY J. (1826-1893), banker. He was the head of the well-known firm of Drexel & Co., Philadelphia, having been identified with it since the age of 13. He was zealous in promoting science and art, especially music, and contributed largely to philanthropic and educational interests. The Drexel Institute of Art, Science, and Industry, Philadelphia, dedicated Dec. 18, 1891, was established by Mr. Drexel, the building costing over $600,000, with an endowment fund of $1,000,000. His name is associated with that of his friend, George W. Childs, in the inception of the Childs–Drexel Home for Union Printers, Colorado Springs, Colo., dedicated in 1892.

Dreyfus Case. This celebrated affair began in September, 1894, when a servant brought to the French war office an unsigned memorandum which was found in the office of the German military attaché at Paris. This paper showed that the writer of it was selling French military secrets. The secret service department set to work to discover the traitor. Suspicion immediately attached to the staff officers, and specimens of the handwriting of all the officers were secured. Two officers at once suggested that the handwriting of the manuscript, or *bordereau*, resembled that of Captain Dreyfus, a Jewish officer on the general staff. The two officers were Marquis De Morès and Colonel du Paty de Clam. Captain Dreyfus belonged to a loyal Alsatian family and had come to Paris in 1874. He prepared himself for a military career, and in 1889 was appointed captain of the first artillery, and four years later was attached to the general staff. Du Paty de Clam was charged with the preliminary inquiry, and on October 14 he wrote Captain Dreyfus asking him to report at the war office. In the meantime the minister of war, General Mercier, a violent anti-Semite, ordered a secret cell to be prepared for Dreyfus. Dreyfus was arrested and imprisoned secretly and was kept in secret until December 5. Du Paty de Clam then informed Dreyfus' wife, searched their house and forbade Mme. Dreyfus to communicate with her husband or try to discover his whereabouts. In October the fact of the arrest was discovered, and on December 19, 1894, the court-martial began. The trial was secret because, as the officers said, "war with Germany might follow the publication of the facts in the case." The judges who sentenced Captain Dreyfus did not see the written documents, and by virtual order of the minister of war Dreyfus was condemned to be degraded and expatriated.

On January 5, 1895, he was publicly degraded, and by an act of the French Chamber he was deported to Devil's Island off the coast of Guiana, where he was placed in solitary confinement. In 1895 Colonel Picquart succeeded as head of the information department of the war office, and he learned by accident that Commandant Esterhazy was the author of the bordereau. In May, 1896, Colonel Picquart accidentally secured the fragments of a local pneumatic tube card, or "petit bleu." The card was addressed to Esterhazy, and after securing samples of Esterhazy's writing he became convinced that Esterhazy wrote the bordereau. This news finally reached Du Paty de Clam, and all possible obstacles were put in the way of Colonel Picquart, and Esterhazy himself decamped to a distant city Another fact against Esterhazy was his acquaintance with the German military attaché, who on the eve of the revelation by Esterhazy, asked to be recalled. The government espoused the anti-Dreyfus cause, and General Billot, the new minister of war, took the position that it was a "chose jugee" (a closed case) and shut off all new inquiries into the case. In autumn of 1897 M. Scheurer-Kestner, vice-president of the senate, became convinced of the innocence of Dreyfus and appealed to the prime minister of war, but with no effect. The impression of Dreyfus' innocence, however, spread in many quarters. Matheiu Dreyfus, a brother of the accused, addressed a letter to the war minister stating that his brother had been sentenced for another's crime and named Esterhazy as the real traitor. Then a series of letters written by Esterhazy to his mistress were discovered and became public, and in these letters Esterhazy slandered the French army to which he belonged. Thereupon the war minister ordered a court-martial, but the "chose jugee" shut out any reference whatever to the Dreyfus case. Of course the trial was a farce, and Emile Zola, in the columns of *l'Aurore*, denounced the Esterhazy court-martial as a sham, accused the war minister and all the officers of the staff of conspiracy, of fraud, and deceit, proclaimed Dreyfus innocent, and dared the government to prosecute him. The government accepted the challenge.

In this trial the "chose jugee" again shut off all evidence concerning Dreyfus, and Zola was convicted and sentenced to a year's imprisonment and a fine of 5,000 francs. During the trial it developed, upon the testimony of General Pellieux, who had charge of the first investigation concerning Esterhazy, that there was in the war department a letter written in 1896 which contained additional and absolutely convincing evidence of Dreyfus' guilt. This assertion was corroborated by General De Boisdeffre, chief of the general staff. In this trial it also became known that the conviction of Dreyfus had been secured by a secret "dossier" (consisting of the bordereau, some forged letters by Colonel Henry, and

her leaders). Mme. Dreyfus asked for a re-
sion of the Dreyfus trial, but was refused.
new trial was granted Zola on a technical
oint, but this was postponed, and Zola
ecame a voluntary exile, and remained
until June, 1899, when he returned to Paris.
eneral Billot was succeeded by General Cav-
gnac as war minister in the summer of 1898.
n July 7 he made a violent anti-Dreyfus
peech in the chamber and quoted the secret
tter of 1896 to which reference had been
ade in the Zola trial. The following day
olonel Picquart, who had been dismissed
om the army on account of his advocacy of
reyfus, proved that this letter was a forgery.
fter some investigation Colonel Henry con-
ssed that he himself had forged the letter in
uestion, the only document in the secret dos-
er containing Dreyfus' name. Henry was
stantly arrested and while in prison either
mmitted suicide or was murdered. The
isclosure of all these facts was followed
osely by the people and caused intense ex-
tement, the line between the factions being
rawn with the Jews on one side, principally,
nd the French on the other. Cavaignac re-
gned from the cabinet and all honest citi-
ens favored a revision of the Dreyfus trial
ecause the verdict was secured with the aid
a self-confessed forger. Esterhazy in the
eantime fled to England, and General Zur-
den, who had succeeded Caviagnac as min-
ter of war, was forced to resign because of
s hostility to revision. He was then made
ilitary governor of Paris, and immediately
rested Colonel Picquart on a charge of hav-
g forged the "petit bleu," which proved
sterhazy's treason. This occurred in Sep-
mber, 1898, and Picquart was put in prison
au secret." The new Bisson ministry, Sep-
mber 26, 1898, referred the Dreyfus verdict
the Court of Cassation, the supreme court
appeals, which, at the end of the following
ctober, began the work of revision. The
urt neither rejected the request for a re-
sion nor quashed the judgment of the court-
artial; it decided to seek more information.
he Bisson ministry came to an end and M.
upuy, who was prime minister at the time of
e Dreyfus trial in 1894, came into office.
e refused to interfere with the Court of Cas-
tion, and during the week of May 29, 1899,
e hearing of the demand for a revision of
e Dreyfus trial was conducted. On June 1
Paty de Clam was arrested on the charge of
ving forged some of the documents used in
e conviction of Dreyfus. June 6th the court
cided to reinstate Dreyfus, bring him back
France, and give him a new trial.
The trial began August 6 and ended Septem-
r 9. It was conducted before seven officers
ting as a court-martial at Rennes. This
al, which was followed in detail by the
ole civilized world, resulted in a verdict of
ilty and imposed a sentence of ten years'
prisonment. The trial was specially noted
the character of the evidence presented by
e accusers of Dreyfus. The generals of the
my headed the accusation and gave their

opinions rather than facts. There was no evidence as such of the guilt of Dreyfus. The peculiar nature of the judging body made it necessary for the defense to prove the prisoner innocent. This they did not succeed in doing absolutely, for the reason that the foreign military attachés, with whom Dreyfus was accused of having had secret relations, could not be summoned as witnesses in the case—so ruled the court-martial.

However, two of the five judges voted for acquittal, and the whole court-martial entered a special plea that the prisoner be not again degraded. Ten days after the sentence was pronounced the French ministry issued a pardon for Dreyfus and the following day he was released from prison. He thus regained his freedom but not his rank in the army.

Drosom'eter (Greek, *drosos*, "dew", and *metron*, "a measure"), an instrument for ascertaining the quantity of dew which falls. It consists of a balance, one end of which is furnished with a plate fitted to receive the dew, the other containing a weight protected from it.

Drowning means death by the air being prevented entering the lungs owing to the mouth and nostrils being immersed in a liquid, the liquid being commonly water. Death may, therefore, occur by drowning in a small quantity of water. When death has been caused by drowning, the skin presents the appearance called goose skin, the face and surface of the body generally are usually pale, a frothy liquid is found in the lungs and air passages, and about the lips and nostrils; water may be found in the stomach, and clenched fingers, holding substances grasped at, may serve to show that a struggle has taken place in the water, and that the body was alive at the time of immersion. Complete insensibility arises, it is probable, in from one to two minutes after submersion, recovery, however, being still possible, and death occurs in from two to five minutes. So long as the heart continues to beat, recovery is possible; after it has ceased it is impossible. Newly-born children and young puppies stand submersion longer than the more fully grown. For the restoration of the apparently drowned several methods are suggested. Those of Dr. Benjamin Howard, of New York, will be described.

Place the body on its face, with the roll of clothing under the stomach, the head being supported on the hand. Pull the body over the roll of clothing to expel water from the chest. Then turn the body on the back, the shoulders being supported. Kneel over the body. Place both hands on the lower part of the chest, so that the thumbs hook in under the lowest ribs and the fingers are spread out on the chest. Steadily press forward, raising the ribs, your own body being thus thrown leaning forward. This enlarges the cavity of the chest and causes air to enter. When the ribs have been raised to the utmost extent, with a slight effort push yourself back to the more erect position, allowing the ribs to recoil to their former position. This expels the air. Repeat the process fifteen times a minute.

Meanwhile, if other persons are present they should be occupied rubbing the body and limbs (*always upwards*) with hands or warm flannel, applying hot flannels, bottles, etc., to the limbs, feet, arm-pits, etc. As soon as the person is sufficiently restored to be able to swallow, give small quantities of hot brandy and water, hot wine and water, hot coffee, etc., and use every effort to restore and maintain warmth. Drowning was formerly a mode of capital punishment in Europe. In Paris a corps of Newfoundland dogs for saving drowning persons is maintained.

Droz (drō), Pierre Jacquet (1721–1790), Swiss mechanician, born at Chaux-de-Fonds. Among his many contrivances were a compensation pendulum, a writing automaton, and an astronomical clock. Henri Louis Jacquet (1752–1791), son of the preceding, followed the same line as his father, and constructed an automaton, representing a young female which played different tunes on the harpsichord; a pair of artificial hands for a young man who was mutilated, by means of which he was enabled to perform most of the necessary offices for himself.

Druids, the priests of the Celts of Gaul and Britain. According to Julius Cæsar they possessed the greatest authority among the Celtic nations. They had some knowledge of geometry, natural philosophy, etc., superintended the affairs of religion and morality, and performed the office of judges. They venerated the mistletoe when growing on the oak, a tree which they likewise esteemed sacred. They had a common superior, who was elected by a majority of votes from their own number, and who enjoyed his dignity for life. They took unusual care to fence themselves round with mysteries, and it is probable that they cherished doctrines unknown to the common people; but that they had a great secret philosophy which was handed down by oral tradition is very unlikely.

Drum, a musical instrument of percussion, of Eastern origin, either cylindrical or hemispherical in shape, with the end or ends covered with tightened parchment, which is stretched or slackened at pleasure by means of cords with sliding knots or screws. Drums are of three kinds: 1, the long or bass drum played with stuff-nob drum-sticks, and used only in large orchestras or military bands; 2, the side drum, having two heads, the upper one only being played upon by two sticks of wood; 3, the kettledrum, a hemisphere of brass or copper, the end of which is covered with parchment, always used in pairs, one drum being tuned to the keynote, and the other to the fifth of the key, the compass of the two together being an octave.

Drum-fish, Drum, *Pogonias chromis*, and other species of the same genus, fishes found on the Atlantic coasts of N. A., and so named from the deep drumming sound they make in the water. They usually weigh about 20 lbs.

Drummond, Sir Henry (1851–1897), b. in Scotland, graduated at University of Edinburgh, and later studied in Germany. He was ordained minister of the Free Church, and in 1884 became professor of science in the Glasgow Free Church College. He published an account of his African trip in 1888. His best known works are, *Natural Law in the Spiritual World*, *The Greatest Thing in the World—Love*, and the *Ascent of Man*. Mr. Drummond has lectured to some extent in the U. S.

Drummond, Thomas (1797–1840), the inventor of the lime-ball light known by his name, was born at Edinburgh. He was educated at Edinburgh and at Woolwich, and entered the army as an engineer. In 1819 he became assistant to Colonel Colby in the trigonometrical survey of Great Britain and Ireland. He invented a heliostat, and first used the light which bears his name about 1825 during the survey of Ireland. He subsequently entered political life, and became in 1835 under secretary for Ireland, a country which he practically ruled with the utmost success for five years.

Drummond, Thomas (1809–1890), b. in Lincoln co., Me., graduated at Bowdoin in 1830, and was admitted to the bar in Philadelphia. In 1835 he removed to Galena, Ill., and in 1860 became U. S. judge for the district of Illinois. Five years later, when the state was divided, he became judge of the northern district, and in 1869 judge of the U. S. circuit court, which office he resigned in July, 1884.

Drummond, William (1585–1649), of Hawthornden, a Scottish poet distinguished for the elegance and tenderness of his verses. He was educated at the University of Edinburgh. He was the first Scottish writer to abandon the native dialect for the language raised to supremacy by the Elizabethan writers. As a historian he is chiefly remarkable for an ornate style, and a strong attachment to the High Church principles of the Jacobites.

Drummond Light, a very intense light produced by turning two streams of gas, one of oxygen and the other of hydrogen, in a state of ignition upon a ball of lime. This light was proposed by Captain Drummond to be employed in light-houses.

Drupe, in botany, a stone fruit; a fruit in which the upper part of the pericarp becomes fleshy or softens like a berry while the inner hardens like a nut, forming a stone with a kernel, as the plum, cherry, apricot, and peach. The stone enclosing the kernel is called the *endocarp*, while the pulpy or succulent part is called the *mesocarp*. In some fruits, as those of the almond, the horse-chestnut, and cocoanut, the mesocarp is not succulent, yet from their possessing the other qualities of the drupe, they receive the name. The date is a drupe in which the stone or endocarp is replaced by a membrane.

Druses, a curious people of mixed Syrian and Arabian origin, inhabiting the mountains of Lebanon and Anti-Lebanon, in whose faith are combined the doctrines of the Pentateuch, part of the tenets of Christianity, the teachings of the Koran, and the Sufi allegories. They describe themselves as Unitarians and followers of Khalif Hakim Biamr-Allah, whom

they regard as an incarnation of deity, the last prophet, and the founder of the true religion.

Drusus, the name of several distinguished Romans, among whom were: MARCUS LIVIUS, orator and politician, became tribune of the people in 122 B.C. He opposed the policy of Caius Gracchus, and became popular by planting colonies. MARCUS LIVIUS, son of the above, was early a strong champion of the senate or aristocratic party, but showed grea skill in manipulating the mob. He rose to be tribune of the people, and was assassinated B.C. 91. NERO CLAUDIUS, brother of the Emperor Tiberius, b. B.C. 38. By a series of brilliant campaigns he extended the Roman empire to the German Ocean and the river Elbe, and was hence called *Germanicus*. By his wife Antonia, daughter of Mark Antony, he had a daughter, Livia, and two sons, Germanicus and Claudius, the latter of whom afterward became emperor. He died B.C. 9.

Dry'den, JOHN (1631–1700), English poet, was descended from an ancient family, his grandfather being Sir Erasmus Dryden of Canons Ashby, Northamptonshire. He was b. near Aldwinkle, Northamptonshire, and was admitted a king's scholar at Westminster under the celebrated Dr. Busby, whence he went to Trinity College, Cambridge, being here elected to a scholarship. After leaving the university he went to London, where he acted as secretary to his cousin, Sir Gilbert Pickering, a favorite of Cromwell; and on the death of the Protector he wrote his *Heroic Stanzas* on that event. In 1661 he produced his first play, *The Duke of Guise*. This was followed by *The Rival Ladies*, and *The Indian Queen*. In 1663 he married Lady Elizabeth Howard. In 1668 he published his celebrated *Essay on Dramatic Poesy*. In 1668 the *Maiden Queen*, a tragi-comedy, was represented. This was followed in 1670 by the *Tempest*, an alteration from Shakespeare, in which he was assisted by Sir William Davenant. Dryden was shortly afterward appointed to the offices of royal historiographer and poet laureate. He now became professionally a writer for the stage. The first of his political and poetical satires, *Absalom and Achitophel* was produced in 1681, and was followed by *The Medal*, a satire against sedition, and *Mac Flecknoe*, a satire on the poet Shadwell. At the Revolution Dryden was deprived of the offices of poet laureate and historiographer. During the remaining ten years of his life he produced some of his best work, including his admirable translations from the classics.

Drying-machine, a machine used in bleaching, dyeing, and laundry establishments, consisting of two concentric drums or cylinders, one within the other, open at the top, and having the inner cylinder perforated at its side with numerous small holes. The goods to be dried are placed within the inner cylinder, and the machine is then made to rotate with great velocity, when, by the action of centrifugal force, the water escapes through the holes in the side. The action of the drying machine is the same in principle as that witnessed when a person trundles a mop to dry it.

Drying-oil, the name given to linseed and other oils which have been heated with oxide of lead; they are the basis of many paints and varnishes. When exposed to the air they absorb oxygen, and are converted into a transparent, tough, dry mass or varnish.

Dry-point, a sharp-pointed instrument used by engravers to incise fine lines in copper without the plate being covered with etching-ground or the lines bit in by acid. This tool is much employed in working the more delicate portions of plate produced as etchings.

Du'alism, the philosophical exposition of the nature of things by the hypothesis of two dissimilar primitive principles not derived from each other. Dualism in religion is chiefly confined to the adoption of a belief in two fundamental beings, a good and an evil one, as is done in some Oriental religions, especially that of Zoroaster. In metaphysics, dualism is the doctrine of those who maintain the existence of spirit and matter as distinct substances, in opposition to idealism, which maintains we have no knowledge or assurance of the existence of anything but our own ideas or sensations. Dualism may correspond with realism in maintaining that our ideas of things are true transcripts of the originals, or rather of the qualities inherent in them, the spirit acting as a mirror and reflecting their true images; or it may hold that, although produced by outward objects, we have no assurance that in reality these at all correspond to our ideas of them, or even that they produce the same idea in two different minds.

Dub'lin, the metropolis of Ireland, is situated in Dublin co., on the east coast of the island, at the mouth of the Liffey, the banks of which for more than two miles from the sea are lined with quays. The principal street at right angles to the river is Sackville street, a splendid street 650 yards long and 40 yards wide, forming a thoroughfare which is continued across the river by O'Connell Bridge, a magnificent structure the same width as Sackville street. The principal public secular buildings are the Castle, the official residence of the viceroy; the Bank of Ireland, formerly the Irish Parliament house; Trinity College; the courts of justice; the customhouse; the King's Inns; the post office; rotunda; corn exchange; commercial buildings; the mansion house; city hall or corporation buildings; etc. The most important literary and scientific institutions are Trinity College (Dublin University); the Royal University; the Royal College of Science; the Roman Catholic University; the College of Surgeons; the Royal Dublin Society; the Royal Hibernian Academy of Painting, Sculpture, and Architecture; the Royal Irish Academy for Promoting the Study of Science, Literature, and Antiquities; the Archæological Society; the Royal Zoological Society, etc. A little northwest of the city, up the Liffey, is the Phœnix Park, with an area of 1,759 acres. In it are the Viceregal Lodge, the residence of the Lord Lieutenant;

the chief secretary's and under secretary's official residences; the Royal Hibernian Military School, and the depot of the Royal Irish Constabulary; as also the gardens of the Royal Zoological Society. Pop. 254,709.

Dublin, UNIVERSITY OF, an institution founded in 1591, when a charter, or letters-patent, was granted by Queen Elizabeth for the incorporation of the "College of the Holy and Undivided Trinity," the University and Trinity College being practically the same. The corporation now consists of a provost, seven senior fellows, twenty-six junior fellows, and seventy foundation scholars. The senate of the university consists of "the chancellor of the university, or, in his absence, of the vice-chancellor, and such doctors or masters of the university as shall have and keep their names on the books of Trinity College." The senate possesses the right of electing the chancellor of the university; it is also the body which grants degrees. The scholarships are tenable for five years, or till the degree of M. A. is attained. The course of general instruction extends over four years. The number of students is usually about 1,300.

Du Bois, Clearfield co., Pa., on Sandy Lick Creek, 127 mi. n.e. of Pittsburg. Railroads: R. & C. branch of Pa.; Allegheny Valley; B., R. & P.; and Clearfield & Mahoning. Industries: lumber, roller mill, iron foundry, milling, hosiery mill, machine shops, car works, casket factory, brewery, tannery, and window glass factory. Surrounding country mineral; coal and gas in large quantities. Du Bois was first settled 30 years ago by John Du Bois and John Runbarger, and is still a borough. Pop. 1900, 9,375.

Dubuque (du-būk'), a city of Iowa, on the right bank of the Mississippi. It occupies an important commercial position as a railway center and entrepôt for the agricultural and mineral products of the northern half of Iowa, and the timber of Wisconsin, and from lead mines in its vicinity. Pop. 1900, 36,297.

Duc'at, a coin formerly common in several European states, especially in Italy, Austria, and Russia. They were either of silver or gold; average value of the former, 75 cents to $1.00, and of the latter about $2.32. It was named from being first coined in one of the the Italian duchies—Lat. *ducatus*, "a duchy."

Du Chaillu (du-shā-yü), PAUL BELLONI, traveler, b. in Paris, 1835. In 1852 he came to the U. S. and became a naturalized citizen. In 1855 he began his first journey through Western Africa, and spent till 1859 alone among the different tribes, traveling on foot upward of 8,000 mi. He collected several gorillas, never before hunted, and rarely, if ever, before seen by any European. The result of this journey was published in 1861. A second expedition was made in 1863, an account of which, under the title *A Journey to Ashango Land*, appeared in 1867. *The Land of the Midnight Sun*, an account of a tour in Northern Europe (1881), had a considerable success. His latest work is *The Viking Age*, a treatise on the ancestors of the English-speaking peoples.

Duck, the name common to all the web-footed birds constituting the Linnæan genus *Anas*, now raised into a sub-family Anatinæ, and by some naturalists divided into two sub-families, Anatinæ and Fuligulinæ, or land ducks and sea ducks. The ducks are very numerous as species, and are met with all over the world. They are often migratory, going northward in summer to their breeding places. Their food is partly vegetable, partly animal. The common mallard or wild duck is the original of the domestic duck. In its wild state the male is characterized by the deep green of the plumage of the head and neck, by a white collar separating the green from the dark chestnut of the lower part of the neck, and by having the four middle feathers of the tail recurved. The wild duck is taken in large quantities by decoys and other means. Some tame ducks have nearly the same plumage as the wild ones; others vary greatly, being generally duller or pure white, but all the males have the four recurved tail feathers. There are several favorite varieties of the domestic duck, those of Normandy and Picardy, in France, and the Aylesbury ducks in England being remarkable for their great size and delicacy of flesh. The *musk duck*, erroneously called the *Muscovy duck*, a native of South America, is the largest of the duck kind, and approaches nearly to the size of a goose. The *canvas-back duck* is peculiar to America, and is celebrated for the excellence of its flesh, Other species of ducks are the shoveler, remarkable for the strange form of its bill; the gadwall, which is more rare in America than in Europe; the pintail or sprig-tail, remarkable for the form of its tail, abundant in both hemispheres; the black or dusky duck, peculiar to America, and very abundant; the summer or wood duck, remarkable for the form of its great beauty, and for its migrations being directly opposed to those of other species; the teal, the eider duck, so well known for its valuable down; the scoter; the pochard or red-head, the scaup duck or blue-bill; the long-tailed duck; the harlequin duck, all found on both continents.

Duckweed, the popular name of several species of *Lemna*, nat. order Lemnaceæ, plants growing in ditches and shallow water, floating on the surface, and serving for food for ducks and geese. Five species are known in Britain, and others are common in America. They consist of small fronds bearing naked unisexual flowers.

Ductil'ity, the property of solid bodies, particularly metals, which renders them capable of being extended by drawing, while their thickness or diameter is diminished, without any actual fraction or separation of their parts. On this property the wire-drawing of metals depends. The following is nearly the order of ductility of the metals which possess the property in the highest degree, that of the first mentioned being the greatest: gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium.

Dudevant (düd-vän), ARMANTINE-LUCILE AURORE DUPIN, MADAME (1804–1876), better

known by the *nom de plume* of George Sand, one of the greatest of French novelists. In conjunction with Jules Sandeau, a young lawyer, she wrote *Rose et Blanche*, which was published in 1831, with the pseudonym Jules Sand. Her son, Maurice Dudevant, b. in Paris, 1825, has written several novels, etc., and has attained a certain reputation as an artist.

Dud'ley, a town of England in an isolated part of Worcestershire inclosed by Staffordshire, 8 mi. n. w. of Birmingham. It is situated in the midst of the "black country," and has extensive coal mines, iron mines, iron works, and limestone quarries. It produces nails, chain-cables, anchors, vices, boilers, fire irons, and has also glass works, brick-works, brass foundries, etc. There are the remains of a castle, said to have been founded in the eighth century by a Saxon prince called Dud, who has given the town its name. Pop. 90,223.

Dudley, JOSEPH (1647–1720), Colonial governor of Massachusetts, b. in Roxbury, Mass. He was the son of Thomas, a former colonial governor. He was graduated at Harvard in 1665, and studied theology; in 1673 he became a magistrate in Roxbury. In 1682 he visited England on behalf of the colonists, but was unable to accomplish their purposes. In 1685 he was appointed president of New England, and in 1687 he was made chief justice of the Supreme Court. From 1690 until 1693 he was chief justice of New York, and in 1693 again went to England to become deputy governor of the Isle of Wight. In 1702 he returned to the U. S. and became governor of Massachusetts. This office he occupied until 1715.

Dudley Limestone, a highly fossiliferous limestone belonging to the Silurian system, occurring near Dudley, and equivalent to the Wenlock limestone. It abounds in beautiful masses of coral, shells, and trilobites.

Duel (from Latin *duellum*, from *duo*, two), a premeditated and prearranged combat between two persons with deadly weapons, for the purpose of deciding some private difference or quarrel. The combat generally takes place in the presence of witnesses called seconds, who make arrangements as to the mode of fighting, place the weapons in the hands of the combatants, and see that the laws they have laid down are carried out. The origin of the practise of dueling is referred to the trial by "wager of battle" which obtained in early ages. This form of duel arose among the Germanic people, and a judicial combat of the kind was authorized by Gundebald, king of the Burgundians, as early as 501 A.D. When the judicial combat declined, the modern duel arose, being probably to some extent an independent outcome of the spirit and institutions of chivalry. France was the country in which it arose, the sixteenth century being the time at which it first became common. Upon every insult or injury which seemed to touch his honor, a gentleman thought himself entitled to draw his sword, and to call on his adversary to give him satisfaction, and it is calculated that 6,000 persons fell in duels during ten years of the reign of Henry IV. His minister, Sully, remonstrated against the practise; but the king connived at it, supposing that it tended to maintain a military spirit among his people. In 1602, however, he issued a decree against it, and declared it to be punishable with death. Many subsequent prohibitions were issued, but they were all powerless to stop the practise. During the minority of Louis XIV more than 4,000 nobles are said to have lost their lives in duels. The practise of dueling was introduced into England from France in the reign of James I; but it was never so common as in the latter country. In France dueling still prevails to a certain extent; but the combats are usually very bloodless and ridiculous affairs. In the German army it is common, and is recognized by law. The duels of German students, so often spoken of, seldom cause serious bloodshed. In the U. S. duels are now uncommon. In some of the states the killing of a man in a duel is punishable by death or by forfeiture of political rights, and in a large number the sending of a challenge is a felony. In the army and navy it is forbidden.

Duff'erin, FREDERICK TEMPLE HAMILTON-BLACKWOOD, MARQUIS OF, British statesman and author, son of the fourth Baron Dufferin and a granddaughter of R. B. Sheridan, b. at Florence 1826. He began his public services in 1855, when he was attached to Earl Russell's mission to Vienna. Subsequently he was sent as commissioner to Syria in connection with the massacre of the Christians (1860); was under Indian secretary (1864–66); under secretary for war (1866); chancellor of the duchy of Lancaster (1868–72); governor general of Canada (1872–78); ambassador at St. Petersburg (1879–81); at Constantinople (1882); sent to Cairo to settle the affairs of the country after Arabi Pasha's rebellion (1882–83); viceroy of India (1884–88); British ambassador to Italy (1889). In 1891 he was appointed ambassador to Paris.

Du'gong, an herbivorous mammal, the *Halicorē dugong*, belonging to the order Sirenia, which includes the manatees. It is a native

Dugong.

of the Indian seas; possesses a tapering body ending in a crescent-shaped fin, and is said sometimes to attain a length of 20 ft., though generally it is about 7 or 8 ft. in length. The skin is thick and smooth, with a few scattered bristles; the color bluish above and white be-

neath. In its osteology it exhibits some points of correspondence with the Pachydermata. Its food consists of marine plants; it yields little or no oil, but is hunted by the Malays for its flesh, which resembles young beef, and is tender and palatable.

Du Guesclin (dü-gā-klan), BERTRAND (1314–1380), constable of France. Mainly to him must be attributed the expulsion of the English from Normandy, Guienne, and Poitou.

Duisburg (dö'is-bur*h*), a flourishing town in Rhenish Prussia, 13 mi. n. of Düsseldorf. It is an ancient place, believed to be of Roman origin, early rose to be a free town, and became a member of the Hanseatic League. It possesses a beautiful church of the fifteenth century, and has iron manufactories, engineering works, chemical works, cotton and woolen mills, etc.; and a large trade greatly facilitated by a canal communicating with the Rhine, which is about 2 mi. distant. Pop. 47,519.

Dulcama'ra (L. *dulcis*, sweet, and *amarus*, bitter; lit. bittersweet), a common British hedge plant, otherwise called bittersweet or woody nightshade. It is found in this country from New England to Arkansas; its root being chewed gives a sensation of bitterness, then of sweetness.

Dul'cimer, one of the most ancient musical instruments, used in almost all parts of the world. The modern instrument consists of a shallow trapezium-shaped box without a top across which runs a series of wires, tuned by pegs at the sides, and played on by being struck by two cork-headed hammers. It is in much less common use in Europe now than it was a century or two ago, and is interesting chiefly as being the prototype of the piano. It is still, however, occasionally to be met with on the Continent at rustic rejoicings, and in England in the hands of street musicians. The Hebrew psaltery is supposed to have been a variety of the dulcimer.

Duluth (du-luth'), a town of the U. S., capital of St. Louis co., Minn., at the s.w. extremity of Lake Superior. Five railroads, including Northern Pacific and St. Paul & Duluth, center here; large docks and other works have been constructed affording a convenient outlet for the surrounding wheat region. Pop. 1900, 52,969.

Dumas (du-mä), ALEXANDRE (1803–1870), French novelist and dramatist. He was the son of a republican general, and grandson of Marquis de la Pailleterie and a negress, Tiennette Dumas. In 1823 he went to Paris, and obtained an assistant secretaryship from the Duke of Orleans, afterward Louis Philippe. He soon began to write for the stage, and in 1829 scored his first success with his drama *Henry III.* It was produced when the battle between the Romanticists and the Classicists was at its height, and hailed as a triumph by the former school. The same year appeared his *Christine*, and in quick succession *Antony*, *Richard d'Arlington*, *Térésa*, *Le Tour de Nesle*, *Catharine Howard*, *Mlle. de Belle-Isle*, etc. Dumas had now become a noted Parisian character. The critics fought over the merits of his pieces, and the scandal-mongers over his prodigality and *galanteries.* Turning his attention to romance, he produced a series of historical romances, among which may be mentioned, *Les Deux Dianes; La Reine Margot; Les Trois Mousquetaires* with its continuations *Vingt Ans Après* and *Viscomte de Bragelonne.* The *Monte-Cristo* and several others are also well known to English readers through translations. Several historical works were also written by him: *Louis XIV et son Siecle; Le Regent et Louis XV; Le Drame de '93; Florence et les Médicis*, etc. The works which bear his name amount to some 1,200 volumes, including about 60 dramas; but the only claim he could lay to a great number of the productions issued under his name, was that he either sketched the plot or revised them before going to press. He earned vast sums of money, but his recklessness and extravagance latterly reduced him to the adoption of a shifty, scheming mode of living. His *Mémoires*, begun in 1852, present interesting sketches of literary life during the Restoration, but display intense egotism. In 1860 he accompanied Garibaldi in the exposition which freed Naples from the Bourbons. He died at the residence of his son, at Puys, near Dieppe, in 1870.

Dumas, ALEXANDRE (1824–1895), son of the above, novelist and dramatist. His works treat mostly of the relations between vice and morals. His first novels, *La Dame aux Camélias* and *Diane de Lys*, were very successful, as were also the plays which were founded on them. His dramas, which are much superior to his novels, deal satirically with the characters, follies, and manners of French society.

Du Maurier (du-mō'ri-ā), GEORGE LOUIS PALMELLA BUSSON (1834–1896), artist and caricaturist, was b. in Paris, 1834, but was a naturalized British subject. He went to England in 1851, and studied chemistry, but soon adopted art as a profession. After studying in Belgium and France he began to draw on wood for *Once a Week*, *The Cornhill Magazine*, etc. He subsequently joined the *Punch* staff and became famous through his weekly drawings to that publication. As a novelist he is immortal for his well-known work, *Trilby.*

Dumbar'ton, a seaport, Scotland, chief town of Dumbarton co. Shipbuilding is carried on to a great extent, and there are foundries, engine works, etc. Originally it was called Alcluyd, and it was the chief town of Cumbria, or Strathclyde. Pop. 13,118. A little to the south is the famous rock and castle of Dumbarton, rising above the Clyde. The rock, which is of basalt, is 240 ft. in height, and about one mi. in circumference at the base. It is one of the fortresses stipulated to be kept in repair by the Act of Union, and the barracks contain accommodation for 150 men. There has been a stronghold here from the earliest times, and the fortress of Dumbarton occupied an important place in Scottish history. The county of Dumbarton is partly maritime, partly inland. More than one half of Loch Lomond and fully two thirds of the islands in it belong to Dumbartonshire. The

Garloch, an arm of the Firth of Clyde, forms a part of the county into a peninsula. The chief minerals are coal, limestone, ironstone, and slate, all of which are wrought more or less. On the banks of the Leven and elsewhere are extensive cotton printing and bleaching establishments; and there are extensive ship-building yards along the Clyde. Vestiges of the Roman wall of Antoninus still exist. Pop. 94,511.

Dumb-bells, weights usually in the form of two iron balls connected by a straight piece for holding, used in gymnastic exercises for strengthening the muscles of the arms and chest.

Dumfries (dum-frēs′), a river port, railway center, and parliamentary burgh, Scotland, capital of the county of same name, and the chief place in the south of Scotland. There are iron foundries, hosiery and tweed factories, tanneries, coach building works, etc. The church of the Minorites which once stood here was the scene of the murder of the Red Comyn by Bruce in 1306. Burns spent his closing years here, and the street in which he lived now bears his name. His remains rest under a handsome mausoleum, and a statue of him was erected in 1882. Pop. 16,673. The county abuts on the Solway Firth. The surface is irregular, but for the most part mountainous, especially in the n. and n.w. districts, where the hills attain a considerable elevation, some of them exceeding 2,000 ft. Good cattle are reared, and are much in request for the English market. The minerals most abundant are coal, lead, iron, antimony, and gypsum. Coal and lead are worked to a small extent. Limestone and freestone abound in various parts. There are no manufactures worth mentioning. Its principal towns are Dumfries, Annan, Sanquhar, Lockerbie, Moffat, and Lochmaben. Pop. 74,308.

Dümouriez (dü-mö-ri-ā), Charles François Duperrier (1739–1823), a French general of great military talent. He served as an officer in the Seven Years' War. In 1768 he went to Corsica as quartermaster general of the small army which was sent for the conquest of that island, and was afterward made colonel. In 1778 he was appointed governor of Cherbourg. At the Revolution he joined the Jacobins, and subsequently the Girondists, and in 1792 he was minister of foreign affairs. War breaking out between France and Austria, he resigned in order to take command of the army; invaded Flanders, and defeated the Austrians at Jemappes and conquered Belgium. Instead of prosecuting the war vigorously he now entered upon measures for the overthrow of the revolutionary government, issued a proclamation, in which he promised the restoration of the constitutional monarchy in the person of the heir to the crown, but was attacked by the Versailles volunteers, and compelled to flee (April 4, 1793). The convention set a price of 300,000 livres upon his head. At first he retired to Brussels, and after various wanderings found a final refuge in England. His *Memoirs*, written by himself, appeared in 1794; an enlarged edition in 1822. He was also the author of a large number of political pamphlets.

Düna (dü′nȧ) (or Western Dvina), a river of Russia, course 650 mi. It is navigable for a considerable distance, but is frozen for about four months each year.

Dünaburg (dü′na-bụrg) (or Dvinaburg), a fortified town, Russia, government of Vitebsk, on the right bank of the Düna, or Dvina, 112 mi. s.e. from Riga. It carries on various industries, a considerable trade, and has three yearly fairs. Pop. 69,033.

Dunbar′, a town of Scotland, in Haddingtonshire, at the mouth of the Firth of Forth. It is a place of great antiquity, having originated in a castle, once of great strength and importance, which underwent several memorable sieges, on one occasion being successfully defended against the English for nineteen weeks by Black Agnes, countess of Dunbar. In 1650 Cromwell totally defeated the Scottish army under David Leslie near the town. The harbor is not very commodious, but the town is an important fishing station. Pop. 3,661.

Dunbar′, William (1460–1520), the most eminent of all old Scottish poets. On the marriage of James IV to Margaret of England Dunbar celebrated the event in a poem of great beauty, entitled, *The Thrissil and the Rois.* His works, which consist of elaborate allegories, satirical and grimly humorous pieces, and poems full of brilliant description and luxuriant imagination, were first collected by David Laing.

Dun′ciad, The, a celebrated satirical poem by Pope, in which he gibbets his critics and foes. The first three books were published in 1728; the fourth book, or *New Dunciad*, appeared in 1742, with illustrations by Scriblerus and notes *variorum.* Cibber was latterly substituted for Theobald as the hero; and among others who figured in the satire were Ambrose Philips, Blackmore, Bentley, Defoe, Dennis Shadwell, Settle, etc.

Dundas′ of Arniston, the name of a family several members of which held a conspicuous place in the legal and political history of Scotland.

Dundee′, a city, of Scotland, in the county of Forfar, on the north shore of the Firth of Tay, about 8 mi. from the open sea, 37 mi. n. n.e. of Edinburgh; in population the third town in Scotland. The chief educational institution is the University College for males and females, whose first session opened in 1883. The town has long been celebrated for its textile manufactures, particularly those of the coarser descriptions of linen, and it is now the chief seat of the linen trade in Scotland and of the jute trade in Great Britain, there being a great number of mills and factories engaged in the spinning and weaving of flax, jute, and hemp. Shipbuilding is extensively carried on, and there are large engineering establishments, etc. Another branch of business is the northern seal and whale fishery. In 1645 Dundee was besieged, taken, and sacked by the Duke of Montrose; and six years afterward it was stormed by

Monk, when a great number of its inhabitants were put to death. Pop. 155,640.

Dundon′ald, Thomas Cochrane, Earl of (1775–1860), British admiral, was b. in Lanarkshire. At the age of eighteen he embarked with his uncle, then Captain, and afterward Sir Alexander Cochrane, in the *Hind*, of twenty-eight guns, and soon distinguished himself by his daring and gallantry. In 1800 he was appointed to the *Speedy* sloop-of-war of fourteen guns, and in the course of thirteen months captured over fifty vessels, but was at last captured himself. In 1805 while in command of the *Pallas* frigate, he took some rich prizes, and for the next four years in the *Impérieuse* performed remarkable exploits in cutting out vessels, storming batteries, destroying signals, etc. On his return to England he entered Parliament. In 1818 he took service in the Chilean navy, his exploits greatly aiding the national independence of that country, as well as soon after of Brazil. In 1831 by the death of his father, he had succeeded to the name and title of Earl of Dundonald; in 1841 he became vice-admiral of the blue; in 1848 he was appointed commander in chief on the North America and West India station; and in 1851 and 1854 respectively he became vice-admiral of the white, and rear-admiral of the United Kingdom.

Dunedin (dun-ē′din), capital of the provincial district of Otago, New Zealand, and the most important commercial town in the colony, stands at the upper extremity of an arm of the sea, about nine miles from its port, Port Chalmers, with which it is connected by railway. Though founded in 1848 its more rapid progress dates only from 1861 when extensive gold-fields discovered in Otaga attracted a large influx of population. It is well paved, lighted with gas, and has a good supply of water. There are many handsome buildings, both public and private; the municipal buildings, the post office, hospital, lunatic asylum, government offices, the university, high schools (boys' and girls'), the new museum, several banks (especially the Bank of New Zealand), the Athenæum, and mechanics' institute, the Free Masons' hall, two theaters, etc. Wool is the staple export. Several woolen and other manufactories are now in existence. There is a regular line of steamers between this port and Melbourne, and communication is frequent with all parts of New Zealand. Through the opening of the new Victoria Channel from Port Chalmers vessels drawing sixteen feet can now ascend to Dunedin at low water. Pop. 45,865.

Dunferm′line, a burgh of Scotland, county of Fife, 3 mi. n. of the Firth of Fourth, and 13 mi. n.w. of Edinburgh. Dunfermline was early a favorite residence of the kings of Scotland, and in it were born David II, James I, Charles I, and his sister Elizabeth. The Benedictine abbey founded by Malcolm Canmore (1070) is now represented chiefly by the Abbey Church, underneath the pulpit of which are the remains of King Robert Bruce. Dunfermline early took the lead in the manufacture of table-linen, and is still unrivaled by any other town in the kingdom. There are collieries in the neighborhood. Pop. 22,365.

Dun=fish, a name for cod cured by being split open, partially salted, piled up in a dark place under salt grass or hay, and then closely packed; named from their dun color.

Dunkers (or Tunkers), a religious sect founded in Schwartzenau, Germany, in 1708, and which takes its name from the Ger. *tunken*, to dip, from their mode of baptizing converts.

Dunkirk′, a seaport town, France, department Nord at the entrance of the Strait of Dover, surrounded by walls, and otherwise defended by forts and outworks. It has several fine churches, a college, a public library, and a gallery of paintings; manufactures of earthenware, leather, soap, starch, ropes; sugar refineries, breweries, distilleries, etc. Pop. 38,025.

Dunkirk, Chautauqua co., N. Y., on Lake Erie, 40 mi. w. of Buffalo. Railroads: L. S. & M. S.; N. Y. L. E. & W.; N. Y. C. & St. L.; W. N. Y. & P; D. A. G. & P. Industries: locomotive works, flour mill, four iron foundries, several planing and lumber mills. Surrounding country agricultural, center of the Chautauqua grape belt. The town was first settled in 1809 and became a city in 1880. Pop. 1900, 11,616.

Dunmore, John Murray, Earl (1732–1809), royal governor of Virginia. He was made a peer in 1756, became governor of New York in 1770, and of Virginia in 1771. In 1772 he went to Williamsburg, Va. In 1776 he raided the settlers on York and James rivers, destroying their property and kidnapping their slaves. On December 9 his band was defeated in a skirmish at Great Bridge, in revenge for which he set fire to Norfolk. In the following year his party occupied Gwynn Island, in Chesapeake River, where he was wounded, and from which they were dislodged. In 1786 he was appointed governor of the Bermuda Islands.

Dunmore, Lackawanna co., Pa. Railroads: Erie & Wyoming Valley, and D. L. W. Industries: iron and steel mills, feed mill, and stove works. It derives its prosperity chiefly from the anthracite coal mines which are worked in the vicinity. Population 1900, 12,583.

Duns, John (1265–1308), commonly called *Duns Scotus*, an eminent scholastic divine. He was the apostle of realism, which was opposed to the systems of nominalism and conceptualism promulgated by the other sections into which the schoolmen were divided. He d., it is said, at Cologne in 1308, leaving behind him numerous works.

Dun′stan, St. (925–988), an Anglo-Saxon divine and statesman. He entered the Benedictine order, became an anchorite at Glastonbury, and in 945 was made abbot by King Edmund. After the death of Edmund, Edred, the next king, made him his prime minister and principal director in civil and ecclesiastical affairs. In the reign of Edwy he was banished, but was recalled by Edgar, and made archbishop of Canterbury. He was

again deprived of power on the accession of Ethelred in 978, and devoted the last years of his life to his diocese and the literary and artistic pursuits of his earlier days.

Dupont, Samuel Francis (1803–1865), naval officer, b. in Bergen Point, N. J. He was appointed a midshipman in the U. S. navy, 1815, and became lieutenant in 1826, and commander in 1842. In 1845 he commanded the frigate *Congress.* He served in the war with Mexico, and was made captain in 1855. In 1857 he was sent on special duty to China. In 1861 he was in command of the navy yard in Philadelphia, and equipped and organized the naval force for service in the Civil War. In 1861, he was appointed flag officer, and given the command of the South Atlantic squadron, and carried Gen. W. T. Sherman's force, numbering 10,000 men, to capture Port Royal, S. C. On November 7 he attacked Fort Walker. In August, 1862, he was made a rear admiral. In 1863, Admiral Dupont was relieved by Admiral Dahlgren, and he returned to Wilmington, Del. He was the author of a treatise on the use of floating batteries for coast defenses.

Düppel (dup'l), a fortified village in the province of Schleswig, Prussia, on the coast of the Little Belt. The place is of considerable strategical importance and has been the scene of some severe struggles between the Danes, to whom it formerly belonged, and the Germans. It was captured by the Prussians in 1864, after a siege and bombardment which lasted nearly two months.

Durand, Asher Brown (1796–1886), painter, b. in Jefferson, N. J. His first great work was to engrave Trumbull's *Declaration of Independence.* In 1825 he produced *Musidora,* and in 1828, *General Jackson.* He made many plates for the annuals, and engraved some heads for the National Portrait Gallery. In 1836 portraiture and landscape painting became his chosen occupations. Of portraits, he completed those of *Jackson, J. Q. Adams, Bryant, Kent,* and others; of figure paintings he executed *Harvey Birch and Washington, The Wrath of Peter Stuyvesant,* and *The Capture of André.* His best known landscapes are: *The Catskills from Hillsdale, The Franconia Mountains, Franconia Notch,* several views of Lake George, and *Kauterskill Cove.* He was one of the founders of the National Academy of Design, and from 1845 until 1861 its president.

Duran'go, a town in Mexico, capital of the state of Durango, about 500 mi. n.w., of Mexico, on an elevation 6,845 ft. above the sea. It is well built, has a cathedral, a mint, manufactures of cotton and woolen goods, leather, etc. Pop. 12,000. The state (area 42,530 sq. mi.) is partly mountainous and unproductive, but has valuable gold, silver, and iron mines, and also fertile tracts. Pop. 265,931.

Durant, Henry Towle (1822–1881), philanthropist, was b. in Hanover, N. H. He was graduated at Harvard in 1841, and afterward read law. In 1846 he was admitted to the bar, and began practise in Boston. He became interested in the New York Belting and Packing Company, and in New York state iron

mines, which ventures were very profitable. In 1863, he retired from the practise of law, relinquished the pursuit of wealth, and made New York City his residence. He then became impressed with the necessity of a college for the higher education of women, which conviction culminated in the establishment of Wellesley College.

Dürer (dü'rėr), Albert (1471–1528), German painter, designer, sculptor, and engraver on wood and metal. In 1505 he went to Venice to improve himself in his art. He painted the *Martyrdom of Bartholomew* for St. Mark's church, which painting was purchased by the Emperor Rudolph and removed to Prague. Maximilian I appointed him his court painter, and Charles V confirmed him in this office. He invented the method of printing woodcuts with two colors. Among his masterpieces in painting are a *Crucifixion, Adam and Eve,* an *Adoration of the Magi,* and portraits of *Raphael, Erasmus,* and *Melanchthon,* who were his friends. Among his best engravings on copper are his *Fortune, Melancholy, Adam and Eve in Paradise, St. Hubert, St. Jerome,* and the *Smaller Passion* (so called), in sixteen plates. Among his best engravings on wood are the *Greater Passion* (so called), in thirteen plates; the *Smaller Passion,* with the frontispiece, thirty-seven pieces; the *Revelation of St. John* with the frontispiece, fifteen plates; the *Life of Mary,* two prints, with the frontispiece.

Du'ress, in law, restraint or compulsion, is of two kinds: *duress of imprisonment,* which is imprisonment or restraint of personal liberty; and *duress* by menaces or threats (*per minas*), when a person is threatened with loss of life or with some kind of injury. An act done under duress is voidable or excusable.

Durga (dụr'gä), a Hindu divinity, one of the names given to the consort of Siva. She is generally represented with ten arms. In one hand she holds a spear, with which she is piercing Mahisha, the chief of the demons, the killing of whom was her most famous exploit; in another a sword; in a third the hair of the demon chief; and in others the trident, discus, ax, club, and shield.

Durham (du'ram), an ancient city and parliamentary borough in England, capital of the county of the same name, on the river Wear, which is crossed here by four bridges, 14 mi. s. of Newcastle. The principal public buildings are the ancient castle—now appropriated to the uses of the university—the cathedral, and other churches, the townhall, county prison, grammar school, etc. The educational institutions comprise the university, the grammar school, a training school for schoolmistresses, and other schools. There are manufactures of carpeting and mustard. The cathedral occupies a height overlooking the Wear. Pop. 14,863. Durham University was founded in 1832, opened in 1833, incorporated by royal charter in 1837. The county is on the n.e. coast of England, having on the e. the German Ocean, on the n. Northumberland, from which it is divided by the rivers Tyne and Derwent, Cumberland on the w., and Yorkshire on the s., the

river Tees parting the two counties. Its area is 647,592 acres, of which two thirds are under cultivation. In connection with the commerce of the county may be noticed its foundries, iron works, potteries, glass houses, iron shipbuilding, engine and machine works.

Durham, Durham co., N. C., 26 mi. n.w. of Raleigh. Railroads: Southern Ry.; Seaboard Air Line; D. & N.; Oxford & Clarksville, and New York & Western. Industries: tobacco factories, flour mills, two iron foundries, four cotton and two hosiery mills, snuff factory, two woolen mills, box, ice, soap, and numerous other factories. Surrounding country agricultural. The seat of Trinity College. The town was first settled in 1862 and became a city by change of charter in 1895. Pop. 1900, 6,679.

Durmast, a species of oak, so closely allied to the common oak as to be reckoned only a variety of it. Its wood is, however, darker, heavier, and more elastic, less easy to split, not so easy to break, yet the least difficult to bend. It is highly valued, therefore, by the builder and cabinet-maker.

Düsseldorf (dus'sel-dorf), a town of Prussia; in the Rhenish province, situated on the right bank of the Rhine, 22 mi. n.n.w. Cologne, one of the handsomest towns in the valley of the Rhine. It is a great focus of railway and steamboat communication, and has a number of handsome public buildings, and several remarkable churches. Among the public institutions, particular notice is due to the Academy of Art. It has the honor of having founded a school of painting, which takes the name of Düsseldorf, and has had a large number of distinguished pupils. The industries embrace iron, cotton, leather, tobacco, carpets, chemicals, objects of art, etc., and the trade is large. Pop. 115,190.

Dutch, the people and language of Holland, or the Netherlands.

Dutch Clover, commonly called white clover, a valuable pasture plant. It has a creeping stem; the leaflets are broad, obovate, with a horseshoe mark in the center; the white or pinkish flowers are in a globular head.

Dutch Metal, an alloy containing 84.5–84.7 per cent. of copper and 15.5–15.3 per cent. of zinc, with a fine golden-yellow color, ductile, malleable, and tenacious. When beaten out by a process analogous to that for gold leaf, until the sheets are less than 1–50,000th part of an inch thick, it constitutes Dutch leaf, or Dutch foil, and is used instead of gold leaf for ornamental purposes.

Dutch Rush, one of the plants known as horsetails, with a firm texture and so large an amount of silex in the cuticle that it is employed as a fine sandpaper for polishing delicate woodwork.

Duyckinck, Evert Augustus (1816–1878), editor, b. in New York. After graduation at Columbia, in 1835, he studied law, and was admitted to the bar in 1837. He traveled in Europe, and on his return edited, with Cornelius Mathews, a monthly magazine, *Arcturus, a Journal of Books and Opinions*, from 1840 till

1842. In 1847 he established *The Literary World*, which he conducted with his brother George until 1853. In 1853–56 he published with his brother the *Cyclopædia of American Literature*, to which a supplement was added in 1865, and of which a new edition was issued by M. Laird Simons in 1875.

Dvorak (dvor-shäk'), Anton, a Bohemian musical composer, b. in 1841. He studied at the Prague Conservatoire and at Vienna. He has composed several operas on national Bohemian subjects, a number of songs, orchestral arrangement of Bohemian dances, several symphonies, a *Stabat Mater*, a cantata (*The Specter Bride*), and an oratorio (*St. Ludmilla*).

Dwarf, a term applied to any animal or plant greatly below the usual size of its kind, particularly to a human being of small dimensions. Accounts of dwarf tribes have been common from early times, such tribes being located especially in Africa; and it would appear from the accounts of Du Chaillu, Schweinfurth, and other travelers, that there are several dwarfish tribes throughout this continent. The Obongo, a race of dwarfs, are described as living in woods near the Okanda River, in wretched huts made of branches. Other races are the Mabongo, and the Akka dwarfs of Central Africa (see *Akkas*); and a race is said to exist in the Congo State, not as a distinct community, however, but mixed with other tribes. Individual dwarfs occur in all races, and were formerly a fashionable appendage to the courts of princes and the families of nobles. Jeffery Hudson, the favorite dwarf of Charles I, at the age of thirty is said to have been only 18 in. high, though he afterward grew to 3 ft. 9 in. Bébé, the celebrated dwarf of Stanislas of Poland, was 33 in.; Wybrand Lolkes, a Dutch dwarf, when sixty years of age was only 27 in.; Charles H. Stratton, "Gen. Tom Thumb," was 31 in. high at the age of twenty-five; Francis Flynn, "General Mite," was only 21 in. at sixteen.

Dwarfing, the process of training up trees or shrubs for ornament in houses so as to cause them never to reach more than a very small size, by keeping them in poor soil; giving them little water, pinching off strong shoots, etc.; practised among the Chinese and Japanese.

Dwight (dwīt), Timothy (1752–1817), American divine, b. in Massachusetts. His father was Col. Timothy Dwight, and his mother was a daughter of Jonathan Edwards. He served as chaplain in the Revolutionary army, and ultimately became president of Yale College. His *Theology* (1818) was for long a standard both in Britain and in America. He was also the author of two poems, the *Conquest of Canaan*, and *Greenfield Hill*, besides numerous unimportant works, consisting of dissertations, occasional sermons, etc.

Dwight, Theodore (1764–1846), journalist, b. in Northampton, Mass. He studied law, was admitted to the bar, and became engaged in many of the political controversies as a Federalist. After serving in the state senate he was elected to Congress in 1806. He edited the Hartford *Mirror* during the War of 1812.

In 1815 he became editor of the Albany *Daily Advertiser*, and in 1817 he removed to New York, where he founded the *Daily Advertiser*, which he edited until 1836. He published *A History of the Hartford Convention* (1833), and the *Character of Thomas Jefferson as Exhibited in His Own Writings* (1839).

Dwina, Northern, a Russian river formed by the union of two small streams in the government of Vologda. It flows in a northwesterly direction, and falls by four mouths into the White Sea. At Archangel, before it divides itself, it is 4 mi. broad. It is navigable as far as Suchona, and is connected with the Volga by canal.

Dy'aks, the aborigines of Borneo, chiefly inhabiting the interior of the island. They are a finely formed race, of a yellow complexion, and are described as docile, industrious, and superior to the Malays. The more advanced of them practise agriculture and dwell in neatly constructed and tolerably comfortable houses. In Sarawak they have made considerable advances in civilization. They are mostly heathens. Head-hunting (hunting their enemies to make trophies of their heads) is practised among them, but has been abolished where European influence prevails.

Dyaus (dyous), the god of the sky in the older mythology of the Hindus. His name is etymologically connected with that of the Greek Zeus.

Dyeing is the art of fixing a new and permanent color on textile substances, usually cotton, linen, silk, and wool. Some preliminary operations are necessary in order to cleanse the stuff from any foreign matters which would prevent the dye having free access to it, as well as to remove any natural coloring which would interfere with the production of bright, clear tints. Cotton and linen fabrics go through a prolonged series of operations in bleaching. Silk is boiled in a solution of fine soap to remove the fatty matter; and wool is cleansed by scouring in weak soap or soda lye or weak ammonia.

The process of dyeing varies much according to the stuff and the coloring matters used. In general animal fibers, like silk and wool, combine more easily with most colors than vegetable fibers, such as linen and cotton. In the case of the former, for example, a simple immersion in aniline dyes is sufficient to produce a fixed color. Such colors are said to be *substantive*, in relation to the stuffs with which they thus combine. Dyes which will not unite directly with the fibers so as to produce a good and permanent color, are termed *adjective*. These dyes require the intervention of another agent to fix them on the different stuffs, and the name of *mordant* is applied to those substances which are employed to make the stuff to be dyed and the dying color combine. Alum, acetate of alumina, chloride of tin, salts of iron, albumen, gluten, tannin, etc., are common mordants. The mordant is generally dissolved in water into which the stuffs to be dyed are plunged. In some cases it is mixed with the color and both are simultaneously applied to the stuff. An important characteristic of mordants is their power of affecting the natural tint of the dye and thus enabling a variety of shades to be produced at small expense. Thus nitrates tend to give a yellow tinge to the colors, alumina deepens and, oxide of tin brightens the natural tints. A process of dyeing to which the name of *Aero-hydraulic Dyeing* has been given, consists in forcing the color through the material by hydraulic pressure. The advantages of the process (patented by G. C. Gibbs) are that the color is forced equally through any thickness of the stuff, which thus remains bright till completely worn out.

The dye stuffs in use at the present day are derived alike from the animal, mineral, and vegetable kingdoms. Among animal dyes *cochineal*, the female insect of *Coccus cacti*, produces the most valuable of scarlet and crimson dyes. A kindred insect, *Coccus ilicis*, produces *kermes*, an important red dye. Galls, which are used both as a dye and a mordant, are produced by the puncture of insects on the leaves and branches of the oak and other trees. Among the vegetable dyes in common use, madder, the root of the *Rubia tinctoria* is perhaps the most important, furnishing various shades of red, purple, brown, and black, as well as the famous Turkey red. *Munjeet* is the root of a closely allied Indian plant. *Logwood*, *Brazil wood*, *sandalwood*, *fustic*, *sappan wood*, are the chief woods used for dyeing purposes. For blue dyes, indigo, obtained from *Indigofera tinctoria* and *Indigofera Anil*, is still the most generally used. Safflower yields a fine pink dye; various species of lichens give us a series of purple dyes known as *archil*, *cudbear*, and *litmus*. Among mineral pigments *Prussian blue*, a ferrocyanide of iron; *ultramarine*, now prepared as a compound of alumina, silica, soda, and sulphur; *chrome yellow*, *cobalt blues*, and *arsenical greens*, are the colors most in use. Among the most notable additions to the list of coloring stuffs within recent years are the aniline dyes of coal-tar origin which yield a great variety of brilliant colors, such as magenta, mauve, aniline, purple, roseine, violine, etc. There are few organic substances which under proper treatment will not yield coloring matter, and of late new coloring matters have been obtained from wood sawdust, lichens, mosses, paper and cotton waste, bran, starch, sugar, soot, etc. In addition to those above mentioned, other dye stuffs are alkanet, annatto, catechu, camwood, French berries, divi-divi, sumach, saffron, turmeric, woad, etc.

Dyer's weed, a plant of the same genus as mignonette, otherwise called *Yellow weed*, *Weld*, or *Woad*, nat. order Resedaceæ. This plant grows in waste ground; it affords a beautiful yellow dye, and is cultivated for that purpose.

Dynam'eter, an instrument used for measuring the magnifying power of telescopes. It consists of a small compound microscope, with a transparent plate, exactly divided, which is fixed to the tube of a telescope, in order to measure exactly the diameter of the distinct

image of the eye-glass. Also same as *Dynamometer.*

Dynamic Theory, a theory explanatory of the essential constitution of matter. In the dynamic theory every body is considered as a space filled with continuous matter; porosity then becomes an accidental quality, but compressibility and dilatability essential properties. The state of a body depends entirely on certain attracting and repelling forces; and its volume must change with every change in the relative proportions of these forces. It is opposed to the *atomic theory,* which supposes every body to be composed of indivisible and impenetrable particles termed *atoms.* These are almost infinitely small, with void spaces between them, so that this theory makes porosity essential to matter.

Dynam′ics is the science which deals with the laws of force in their relation to matter at rest or in motion, and as such it is differentiated from *kinematics,* which considers motion mathematically, and apart from the forces producing it. It is to Newton that we owe the clear statement of the three primary laws of force. These are: 1, That every body remains in a state of rest, or of uniform motion along a straight line, unless it is compelled by force to change that state. 2, That change of motion is in proportion to the force employed, and occurs along the straight line in which the force acts. This change of motion includes both change of rate and of direction. 3, That, as the result of every action, there is also and always an equal reaction. These laws, which were formulated from experiment, involve the conception of force as a primary influence or action expressed in terms of space, time, and matter. Now, in dealing with the laws of force, a standard of measurement is required which shall be applicable to all forces at all times, and we therefore require to begin by establishing units of space, time, and mass. There are two systems of units in use, the one British, the other French. In the British system the foot is taken as the unit of length, and the second as the unit of time. In the French the centimeter is the unit of length, the second the unit of time; the unit velocity in the one case being that of one foot per second, in the other one centimeter per second. The British unit of mass is the pound (the mass of a certain lump of platinum deposited in the exchequer office, London); the French the gram; and accordingly the French units of space, mass, and time are commonly known as the C. G. S. (centimeter, gram, second) units. As the weight of a pound (or a gram) is not the same at all parts of the earth's surface it cannot give us of itself an absolute or dynamical unit of force, that is, an invariable unit; but taking it in conjunction with unit time and unit velocity, we do obtain such a unit. Two absolute units of force are in common use in dynamics, the *poundal* and the *dyne;* the latter being the absolute unit in the C. G. S. system. The former is *that force which, acting on the mass of one pound for one second, generates in that mass a velocity of one foot per second.* The latter is *that force which, acting on the mass of one gramme for one second, generates in that mass a velocity of one centimeter per second.* It is important in dynamics to distinguish between *mass* and *weight.* The *mass* of one pound is the quantity of matter equal to a certain standard quantity (a certain lump of metal) and is quite independent of force. The *weight* of one pound is the force with which the mass of one pound is attracted to the earth's surface by the force of gravity. Another important term is *momentum:* the momentum of a body in motion at any instant is the product of the mass of the body and the velocity at that instant. Dynamics is divided into two great branches: *statics,* which treats of solid bodies at rest under the action of forces; and *kinetics,* which treats of the action of forces in producing motion in solid bodies. Formerly the latter alone was called dynamics, and to this, in conjunction with statics, the general name *mechanics* was given. In the wide sense dynamics includes also hydrostatics.

Dy′namite, an explosive substance patented by A. Nobel in 1867. As originally made it consists of a siliceous earth obtained at Oberlohe in Hanover and known as *kieselguhr,* impregnated with 75 per cent. of nitroglycerine, the object of the mixture being to facilitate the carriage and use of the substance by diminishing its susceptibility to explode by shock while not destroying its explosive force. The siliceous matter is of diatomaceous origin; it is extremely friable and porous, and has a considerable absorbent power. Dynamite thus prepared has the appearance of raw sugar. Diatomite, a substance superior to kieselguhr, is now also employed, and various other substances have been used to mix with the nitroglycerine, such as charcoal, sand, sawdust, etc. The mixture remains without change for any length of time, unless exposed to water. It burns away quietly if a light is applied to it, but explodes if heated to a high temperature. Usually it is exploded by a specially arranged fulminating cap. Its explosive force is several times that of gunpowder, which it has largely superseded for blasting.

A dynamite cartridge is about eight in. long and one and a quarter in. in diameter, and weighs about half a pound. Before dynamite can be made the manufacturer must make nitroglycerine, gun cotton, and other explosives. Nitroglycerine is the most powerful explosive yet invented. Glycerine made by soap makers is the basis of nitroglycerine. This is brought to the factory in tank cars and forced by compressed air into storage tanks where it is kept until needed. The factory is usually an isolated building constructed of wood, with no stone or bricks, so that in case of explosion the danger is decreased. The mixture of glycerine, nitric and sulphuric acid, which make nitroglycerine is made in a lead vat. The acids are first mixed and then the glycerine in the form of a fine spray is introduced. The chemical reaction produces heat and the process has to be carefully

watched in order to prevent too high a temperature. When the mixture has cooled it is drawn off. Nitroglycerine is an oily, sweet-tasting mixture, and so poisonous that severe headaches are caused by simply handling it. Pure nitroglycerine cannot be safely shipped and is seldom used in any form except for cleaning oil wells, and then it is mixed on the spot, placed in tin cartridges, and dropped into the well. When mixed with other substances, however, it may be handled with comparative safety. It is usually mixed with a preparation known as "dope"—a combination of nitrate of soda, wood pulp, and magnesia. This mixture is made in a trough and is then made into cartridges known as dynamite cartridges. The explosive power of dynamite depends upon the proportion of nitroglycerine to the "dope." For ordinary rock blasting about 40 per cent. of nitroglycerine to 60 per cent. of the "dope" is used. Sometimes 75 per cent. of glycerine to 25 per cent. of "dope" is used in breaking up salamanders which form in blast furnaces and in heating furnaces used in making iron. Dynamite is exploded by a cap which is placed in the cartridge just before it is lowered into the hole. Safety fuses and electricity are used for exploding the cap. The fuse is so constructed that it burns three, five, or ten minutes as desired before the cap explodes, and the cap is fired by electricity by sending a current through the platinum wire which is in the cap and which grows white hot when the current is turned on. For some blasting and tunneling gun cotton is used. This is a mixture of nitroglycerine, cotton or wood cellulose, and resembles in looks soft gelatin. It gives out less fumes than dynamite and the fumes do not cause headache. Nitroglycerine is less than fifty years old, being discovered in 1847 in Paris. For several years after its discovery it remained simply as a feared explosive and was made only in small quantities by chemists. It was soon discovered, however, that it could be handled safely by mixing with other ingredients to form dynamite.

Dy′namo, the name now usually given to what was originally called the *dynamo-electric machine.* The object of such machines is to produce electric currents by means of mechanical power, and they differ from *magneto-electric* machines, which have a similar object, by the circumstance that in place of the permanent steel magnets which form a necessary part of a magneto-electric machine, electro-magnets are employed. In the original dynamo-electric machines the current by which the electro-magnets were made was identical with the current given off by the machine, or else was a portion diverted from it; but in an important class of machines the current which makes the electro-magnets has an independent source, and to these machines the name "dynamo" is also applied. The advantage of dynamo over magneto machines lies in their greater compactness, arising from the fact that electro-magnets are much stronger than permanent steel magnets of the same bulk. The extensive use of dynamos as the principal commercial sources of electric currents may be said to date from the improvements introduced in their construction by Gramme of Paris. The armatures of the monster dynamos built by the Westinghouse Company for the World's Fair weighed about 21 tons each, and were about 7½ ft. in diameter. The total weight of the twelve dynamos was 900 tons, having a maximum capacity of 180,000 lights, and requiring engines with an aggregate of about 12,000 horse power to work them. The dynamos of the Deptford Central Station, London, are, however, the largest and most wonderful electrical machines in the world. The armature ring for each of the 10,000 horse-power dynamos measures 35 ft. in diameter. It is made of cast-iron in eleven pieces. The armature and shaft weigh 225 tons, and the field magnets 350 tons more. This is exclusive of the massive bed-plate on which the engines and field magnets stand.

Dynamom′eter, any instrument for measuring the relative strength of men or animals, or the force of machinery. Commonly it consists of a spiral spring suitably applied. When the pull upon a draught implement, as a plow for instance, is the point to be determined, the dynamometer is made a link in the draught chain, and the amount of extension or collapse which it suffers indicates the intensity of the strain.

Dys′odile, a yellowish or greenish foliated mineral found in limestone, with remains of fish and of plants, which, when ignited, burns and emits a very bad smell.

Dz̧e′ren (dze′ron), the Chinese antelope, a remarkably swift species of antelope inhabiting the dry arid deserts of Central Asia, Thibet, China, and Southern Siberia. It is nearly 4½ ft. in length, and 2½ high at the shoulder.

Dzig′getai (or Kiang), an animal found in Central Asia, allied both to the horse and ass. Its head is large like that of the ass, but in form resembles that of the horse. The ears also resemble those of the horse, It runs with a rapidity exceeding that of the best Arabian horses.

Dzoungaria, a Chinese territory in Central Asia. It has an area of 147,950 sq. mi., and pop. 600,000. It is administratively connected with Kuldja, and since the surrender of Kuldja by the Russians in 1880 is again under Chinese rule. Dzoungaria, once the center of an independent empire, was first conquered by the Chinese in 1757.

E

Eads

E, the second vowel and the fifth letter of the English alphabet. It occurs more frequently in English words than any other letter of the alphabet. Its long or natural sound in English coincides with the sound of *i* in the Italian and French languages, as in *here, mere, me.* It has also another principal sound, a short one, heard in *met, men.* It has besides a sound like *a* in *bare*, as in *there, where*, etc., and the obscure sound which is heard in *her.* As a final letter in English it is generally silent, but it serves to indicate that the preceding vowel is to have its long sound, as in *mane, cane, plume.* When two *e*'s come together the sound is generally the same as that of the single *e* long, as in *deem, esteem, need.*

Eads, James Buchanan (1820–1887), civil engineer; b. at Lawrenceburg, Ind. At the age of thirteen he went to St. Louis, Mo., and became clerk on a steamboat. In 1842 he constructed a diving-bell boat, which was employed in recovering cargoes from sunken vessels. This invention brought him a fortune, and a few years later he erected the first glass works west of the Mississippi River. He constructed eight light-draught ironclads, first used at Fort Henry 1862. The same year he designed six bullet-proof propellers with turrets worked by steam, the first application of steam to the manipulation of heavy guns. From 1867 to 1874 he was engaged in designing and constructing the famous "Eads bridge" over the Mississippi River, connecting St. Louis and East St. Louis. This was a great piece of engineering. Eads was the promoter of many improvements along the Mississippi River, especially at New Orleans, where he cut a channel through South Pass 200 ft. wide, with a central depth of not less than 30 ft. He d. at Nassau, Bahama Islands.

Eagle, the general name of raptorial birds that form a group or sub-family (Aquilīnæ) of the great family Falconidæ, which includes the eagles, falcons, and hawks. The eagle is popularly regarded as the noblest and most courageous of the rapacious birds. It soars to a greater height than any other bird, from which circumstance the ancients considered it as the bird or messenger of Jove. The genus *Aquila* which includes the most typical eagles, is distinguished by its long and powerful bill, the curve commencing at the cere, by its wings reaching to the tip of the tail, and by its tarsi being feathered to the toes. The imperial eagle is probably the species to which the popular belief in the courage, strength, and nobleness of eagles is to be traced. The golden eagle measures over 6 ft. from tip to tip of the expanded wings, and 3 ft. from the beak to the end of the tail. The adults have the body brownish, becoming darker with age; the feathers of the head and neck pointed,

Eagle

and of a golden-red hue. This species is found all over the northern hemisphere. It was once common in the Highlands of Scotland, but is now becoming rare. The Kirghis and other tribes of Central Asia use the golden eagle to kill antelopes, foxes, and even wolves. Another is the erne or sea-eagle, found near the seacoast or lakes, and feeding largely on fish. The general color is grayish-brown, the head pale-colored, the tail white. The bald

Eagle Hawk.

eagle, found in North America and Northeast Asia, is the symbol of the U. S. Like all members of the genus his diet is less restricted than that of the true eagles; and he even takes carrion. Another is the serpent eagle, or short-toed eagle, which ranges through Southern Europe, Asia, and especially North Africa. In structure and habits this bird approaches the buzzards.

Eagle, as a symbol. The eagle first appears as a war standard among the Persians, through whom it reached the Egyptians. As the standard of the Roman armies it was first used by Marius, and latterly took the place of all the other emblems at the head of the legions. It was first made of wood, then of silver, and finally, under Cæsar and his successors, of gold. In the mediæval ages the eagle became the heraldic emblem of the old German Empire, and was made double-headed in the fourteenth century. When the old German Empire ceased the double-headed eagle was retained by Austria. A double-headed eagle is also the national military symbol of Russia, as a single-headed eagle is that of Prussia and the U. S. The latter stands with outspread wings guarding a shield, with the motto *E pluribus unum.* The eagle is also the badge of several orders.

Eagle, a gold coin in the U. S. of the value of ten dollars. It was first coined in 1795. There

1. Harpy Eagle of South America.

2. Yellow, or Rock Eagle.

are also half-eagles, quarter-eagles, and double eagles, of proportionate values.

Eagle Hawk, a name of birds belonging to the eagle group, but smaller than the true eagles, with comparatively short wings and long legs, natives of South America.

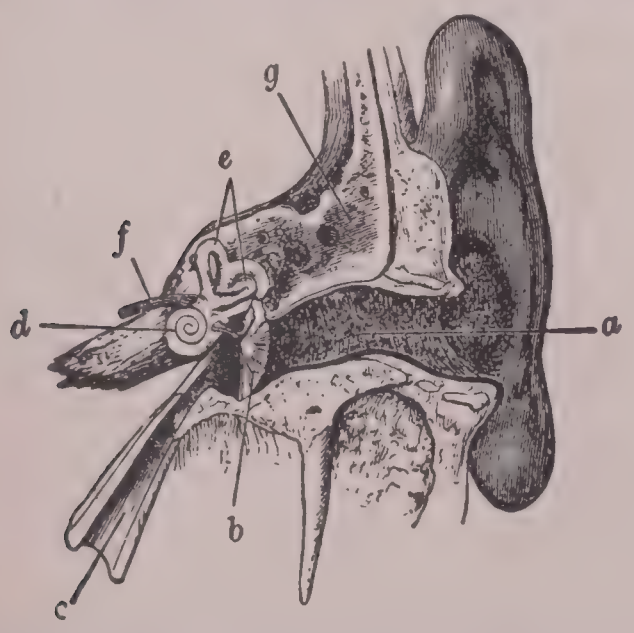
Eagle Owl, one of a sub-family of owls, the most remarkable species of which is the great horned owl, little inferior in size to the golden

Eagle Owl.

eagle. It is found in the mountainous parts of Central Europe. An allied species, the Virginian horned owl is found in almost every quarter of the U. S.

Eames, Emma (Emma Hayden Story), American soprano singer, b. in Shanghai, China, 1868. Her parents were visiting in China at the time. She studied music in Boston and Paris and made her debut in 1889 as Juliette. She married Julian Story in London in 1891. She is very popular.

Ear, the organ of hearing. It is situated at



Sectional view of the external, middle, and internal Ear, showing the interior of the Auditory Canal, Tympanic Cavity, and Eustachian Tube.
a, The auditory canal; *b*, the tympanum; *c*, the Eustachian tube, leading to the pharynx; *d*, the cochlea; *e*, the semicircular canals and vestibule, seen on their exterior by the removal of the surrounding bony tissue; *f*, auditory nerve; *g*, temporal bone.

the side of the head, and in the higher vertebrates is divided into the outer, middle, and inner ear. See *Anatomy.*

Early, Jubal A. (1816–1894), general, was b. in Franklin co., Va., and graduated at West Point in 1837. He served in the Florida and Mexican wars. In the Civil War he fought against the Union in the battles of Fredericksburg, Chancellorsville, and Gettysburg; he also commanded in the Shenandoah Valley, where he was defeated by Sheridan. His want of success compelled General Lee to remove him from command. Since the war a manager of the Louisiana lottery.

Earring, an ornament for the ear, consisting of a ring or hook passing through the lobe, with a pendant of diamonds, pearls, or other jewels frequently attached. Earrings were commonly worn among the Oriental nations, and by both sexes, from the earliest times. Among the Greeks and Romans they were not so commonly worn by men as by women.

Earth, the planet which we inhabit, a nearly spherical body which every twenty-four hours rotates from west to east round an imaginary line called its axis—this axis having as its extremities the north and south poles respectively—while in the course of a year it completes a revolution round the sun. To an observer whose view is not obstructed any part of the earth presents itself as a circular and horizontal expanse, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity, the earth was regarded as a flat, circular body, floating on the water. But even in antiquity the spherical form of the earth began to be suspected. It is only on this supposition that we can explain how the horizon of vision grows wider and wider the higher the position we choose, how the tops of towers and mountains at a distance become visible before the bases, how the hull of a ship first disappears as she sails away, and how as we go from the poles toward the equator, new stars become visible. Besides these proofs there are many others, such as the circular shadow of the earth seen on the moon during an eclipse, the gradual appearance and disappearance of the sun, and, lastly, the fact that since 1519 it has been regularly circumnavigated.

The earth is not, however, an exact sphere, but is very slightly flattened at the poles, so as to have the form known as an *oblate spheroid.* In this way the *polar diameter*, or diameter from pole to pole, is shorter than the diameter at right angles to this—the *equatorial diameter.* The most accurate measurements make the polar diameter about 27 mi. less than the equatorial, the equatorial diameter being found to be 7,925.6 mi., and the polar 7,899.14. The earth is regarded as divided into halves—the northern and the southern hemisphere—by the *equator*, an imaginary line going right round it midway between the poles. In order to indicate with precision the position of places on the earth additional circles are imagined to intersect one another on the surface in such a manner that those of the one set all pass

through both poles, while those of the other are drawn parallel to the equator. The former are called *meridians*, the latter *parallels of latitude*, and by them we can tell the latitude and longitude, and thus the exact position of any place.

Many experiments by various methods have been made in order to determine the average density of the earth, that is, the quantity of matter it contains. Among these methods may be mentioned: 1, that of determining the attraction of a mountain on the direction of a plumb-line and calculating from thence the density of the earth; 2, that founded on the difference of oscillation in a pendulum when placed at the summit of a mountain and when at the sea level; 3, the converse of the preceding method, by the determination of the difference of gravity at the top and the bottom of a deep mine, by pendulum experiments; 4, Cavendish's experiment with the torsion balance, which attempts to compare the attractive force of two large lead balls over other two small lead balls with that exercised by the earth. From these and other experiments it has been calculated, taking the mean of all results, that the density of the earth is to that of water as 5,639 to 1.

The earth, in common with the other planets, moves around the sun, completing its revolution in about 365 days and 6 hours, and thus forming our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; being about 3,000,000 mi. nearer at one time than another, its least distance, according to recent calculations, being 89,897,000 mi., its greatest, 92,963,000, and the mean distance, or half the length of the long axis of the orbit, 91,430,000 mi. From this it may be calculated that the velocity of the earth in its orbit is about 17 mi. a second. In winter (speaking of the northern hemisphere) the earth is nearest the sun and in summer farthest from it: for the difference in the summer and winter temperature is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The passage of the earth round its orbit causes the sun to appear as if it described a similar orbit in the heavens; and hence it is that at one time of the year one group of stars is seen in the neighborhood of the sun at sunrise and sunset and at another time another group. This apparent path of the sun is the *ecliptic*, and corresponds with what would be the path of the earth as seen from the sun; and the groups of stars through which the sun successively passes form the *zodiac*.

The earth's daily motion about its own axis takes place, according to mean time, in twenty-three hours, fifty-six minutes, and four seconds. As the axis on which the earth performs its diurnal rotation forms with the plane of its path about the sun an angle of $23\frac{1}{2}^\circ$ (which angle also represents that between the plane of the ecliptic and the plane of the earth's equator), the sun ascends in the heavens from March 21 to June 21 (the summer *solstice*), about $23\frac{1}{2}^\circ$ above the equator toward the north pole, and descends again toward the equator from June 21 to September 23; it then sinks till December 21 (the winter *solstice*), about $23\frac{1}{2}^\circ$ below the equator, toward the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them. For all countries lying beyond the equator, day and night are equal only twice in the year (at the *equinoxes*). At the summer solstice the north pole of the earth is turned toward the sun, and the south pole away from it, and for $23\frac{1}{2}^\circ$ round the former there is a period of longer or shorter duration during which the sun is continually above the horizon for more than twenty-four hours, while round the latter is an equal extent of surface within which the sun for similar periods is below the horizon. The reverse state of matters occurs at the winter solstice. The circles bounding these regions are called respectively the *arctic* and the *antarctic* circle, and the regions themselves the *polar* or *frigid zones*. Throughout a region extending to $23\frac{1}{2}^\circ$ on each side of the equator the sun is directly overhead at every point in succession twice in the year. The circles which bound this region are called the *tropics*, that in the northern hemisphere being the tropic of *Cancer*, that in the southern the tropic of *Capricorn*, while the region between is the *torrid zone*. The regions between the tropics and the polar circles are respectively the *north* and *south temperate zones*.

From the evidence furnished by volcanoes, hot springs, sinking of mines, etc., it is known that the earth has a high internal temperature of its own. Taking the average of the various observed rates of increase this temperature seems to increase 1° F. for every 60 ft. of descent. Assuming this to continue, the rocks at a depth of 2 mi. would be as hot as boiling water, and at a depth of 50 mi. the heat would be such as at the surface would melt every known solid. This being so, various theories as to the internal condition of the earth have been proposed: 1, That a thin envelope or crust surrounds a molten interior. It can be shown, however, that as tides must be produced in such a molten mass the cool outer crust would be unable to withstand the enormous force of these unless it were about 2,000 mi. thick. 2, That the interior is solid, with spaces here and there filled with liquid or gaseous material. This theory assumes that there are within the earth enormous cavities filled with molten rock, which escapes, when local pressure is removed, in the form of volcanic outbursts. 3, That the earth consists of a thin crust, a large solid nucleus, and a liquid film between the nucleus and the crust; the temperature at the center being not much greater than comparatively near the surface. 4, That the earth is solid to the center, but any part may become liquid if local pressure is removed. We know that if the pressure on a solid be increased the melting point is cor-

respondingly raised; now the pressure at the center of the earth, or even at the depth of 50 or 100 mi., must be something enormous, and probably is so great as to keep the rocks there permanently in a solid condition, notwithstanding the heat. This last theory is considered the most probable. On the supposition of its correctness volcanoes might be explained by supposing that at certain points here and there pressure is removed by the elevations of portions of the earth's surface which are constantly taking place, and that this allows the rocks to liquefy. Water may then soak down to these liquid rocks, and being converted into steam produce the various volcanic phenomena.

The earth is believed to have condensed and solidified from a gaseous or nebular condition, and to have once had a far higher temperature than now. If such were the case the outer surface, losing heat by radiation, would be the first part to cool quickly; while the interior, losing its heat by conduction, would not cool so rapidly, and therefore would naturally have a higher temperature than the portion at the surface. This is what all observations indicate the condition of the earth to be, and the shape of the earth also indicates that it must once have been in a fluid state.

Another feature that the earth as a whole presents is its magnetism. When a magnetic needle is balanced on a point it remains at rest in one position only, pointing then nearly due north and south. This can be explained only on the supposition that the earth acts as a great magnet. It has in fact two poles—a north and a south magnetic pole—which are not very far from, but by no means coincident with, the geographical poles. There is also a neutral line or magnetic equator, which does not greatly diverge from the geographical equator. The earth acts upon all magnets as they act upon each other, and it is for this reason that they point north and south.

The surface of the earth contains over 196,000,000 sq. mi., of which scarcely a third part is dry land, the remaining two thirds being water. The land is arranged into masses of irregular shape and size, the greatest connected mass being in the eastern hemisphere. The chief masses receive the name of continents, detached masses of smaller size forming islands. The surface of the land is variously diversified, exhibiting mountains, valleys, plains, plateaus, deserts, etc. The water area of the earth is divided into oceans, seas, bays, gulfs, etc., while rivers and lakes may be regarded as features of the land surface. The great phenomena of the oceans are currents and tides. The population of the whole earth is estimated at from 1,350 to 1,450 million. The earth is attended by the moon as a subordinate or subsidiary planet.

Earth Currents, violent electrical disturbances of the nature of transient currents, which rush in one direction or the other, and by which telegraph lines, and particularly long submarine lines, are constantly troubled. Their origin and nature are not thoroughly

understood, but they are found to be very intimately connected with the perturbations of terrestrial magnetism called *magnetic storms*, and these, it is well known, are closely connected both with the appearance of the *aurora borealis* and with the occurrence of the sun's spots.

Earthenware, a name applied to the commoner sorts of pottery ware. The older kinds of earthenware, such as Majolica, Delft ware, Faience, and Palissy ware, are not only glazed, but are besides elaborately colored and enameled and ornamented with raised figures of various kinds.

Earth-nut, an umbelliferous plant. The leaves are ternately divided, and the small white flowers are in terminal umbels. The tuber or nut is about 4 or 6 in. below the surface, at the termination of a long slender root. It is brown, the size of a chestnut, of a sweetish, farinaceous nature, resembling in taste the common chestnut. Swine are very fond of the nuts, and fatten rapidly where they are abundant.

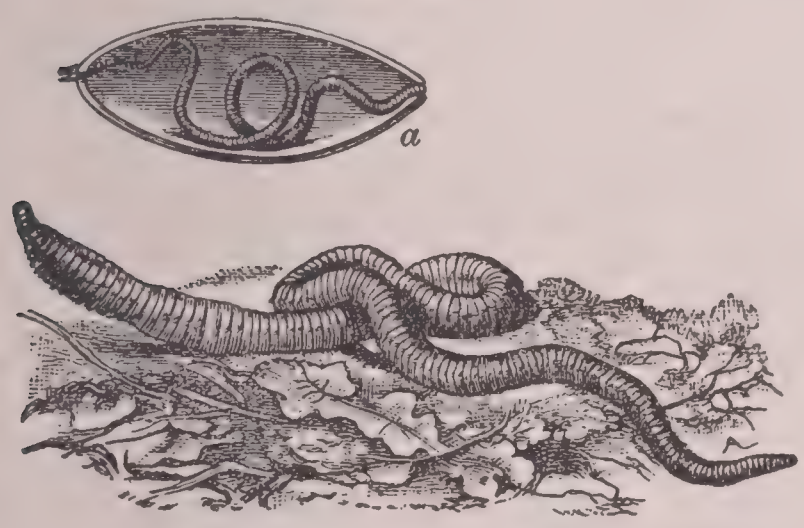
Earthquake, a shaking of certain parts of the earth's surface, produced by causes not perceivable by our senses. This motion occurs in very different ways, having sometimes a perpendicular, sometimes a horizontal undulating, and sometimes a whirling motion. It also varies much in degrees of violence, from a shock which is hardly perceptible to one which bursts open chasms and changes the appearance of the ground itself. During these shocks sometimes smoke and flames, but more frequently stones and torrents of water, are discharged. There is little doubt that earthquakes and volcanic eruptions are kindred phenomena, the latter differing from the former principally in proceeding from a permanent crater. All observations go to prove that both are due to disruptions produced by internal heat at a great depth beneath the surface of the earth. Of the particular way in which this force works, however, there are various theories. It has been thought by some that the center of earthquakes and volcanic disturbances is always near the sea or other large supplies of water, and that the disturbances are directly caused by the filtration of the water down to igneous matter, and the consequent generation of vast quantities of steam which frees itself by explosion. Others have sought to explain earthquakes as part of the phenomena of a planet cooling at the surface. The steady contraction of matter caused by the decay of heat would be likely to produce large cavities with an increasing tension of the neighboring strata, till a tremendous subsidence, involving convulsions reaching to the earth's surface, removed the strain. The most remarkable earthquakes of modern times are those which destroyed Lima in 1746, and Lisbon in 1755; still more recent are the earthquakes that visited Calabria in 1857, Peru and Ecuador in 1868, the island of Ischia in 1884, Charleston and that district of the U. S. in 1886, Menton and the Riviera of Italy in 1887.

Earths, a term applied to certain tasteless, inodorous, dry, uninflammable, nonvolatile, insoluble substances, difficultly fusible, and of a moderate specific gravity, which constitute by far the greatest part of the gravel and soil that go to make up the mountains, valleys, and plains of our globe. They include *lime, baryta, strontia, magnesia, alumina*, etc. The earths were regarded as simple bodies until Sir H. Davy proved them to be compounds of oxygen with metals.

Earth Shine, in astronomy a name given to the faint light visible on the part of the moon not illuminated by the sun, due to the illumination of that portion by the light which the earth reflects on her. It is most conspicuous when the illuminated part of the disc is at its smallest, as soon after new moon. This phenomenon is popularly described as "the old moon in the new moon's arms."

Earth Tremors, slight vibrations of portions of the earth's surface that may be noted by means of special instruments, their cause not being known.

Earthworm, a genus of common worms, order Oligochæta, belonging to the abranchiate (having no branchiæ, or external respiratory organs) section of the class Annelida. They have a long, cylindrical body, divided by transverse furrows into numerous rings. The mouth is destitute of teeth, and they have no eyes, tentacles, or cirrhi. They are hermaphrodite. The common earthworm attains nearly a foot in length. It subsists on roots, woody fibers, animal matter, etc. It moves by the



Common Earthworm. *a.*—Young Worm Escaping from the Cocoon.

contractions of successive parts of the body aided by a double row of bristles. They are of great service to the agriculturist by loosening the soil and increasing its depth. This is chiefly the result of their mode of nourishment, since they deposit the soil they have swallowed, after digestion, in heaps called *worm castings* which brings up rich fine soil to the surface, gradually covering the upper layer sometimes to the extent of several inches.

Earwig, a common insect whose name is derived from its supposed habit of insinuating itself into the ears of persons.

East Cape, the most easterly point of Asia, projecting into Bering's Strait nearly opposite Cape Prince of Wales in Alaska.

Easter, the festival commemorating the resurrection of Christ, observed in many branches of the Christian church. By the first Christians it was considered to continue the feast of the *Passover*, at which the paschal lamb, a type of Christ, was sacrificed. Hence its name in Greek, French, and other Romance languages is taken from the Hebrew *pesach*, passover. The English name comes from the Anglo Saxon *Eostre*, a goddess of light or spring, whose festival was celebrated in April. There was long a dispute in the Christian church as to the proper time for holding Easter, the Christians of the East celebrating it on the same day as that on which the Jewish Passover fell, that is, the 14th of Nisan, while the majority of the church celebrated it on the Sunday next after this day. The controversy was decided by the Council of Nice in 325, which settled that it was to be reckoned as at present, namely, that Easter is the first Sunday after the full moon which happens upon or next after March 21, and if the full moon happens on a Sunday, Easter day is the Sunday after, but, properly speaking, for the "full moon" in the above the "fourteenth day of the moon" should be substituted.

Common Earwig. *a.*—Larva; *b.*—Pupa; *c.*—Perfect Insect.

Easter Island, an island in the South Pacific Ocean, lon. 109° 17′ w.; lat. 27° 6′ s. It is of a triangular form, one side about 12 mi. long, the other two about 9 each; highest point, 1,200 ft. The soil is fertile, but little cultivated. There are some remarkable sculptures on this island, consisting of gigantic stone images in great numbers. The greater part of the island be-

Stone Statues on the side of the Volcano Ronororaka, Easter Island.

longs to an Englishman, and is utilized as a grazing farm for sheep and cattle. The inhabitants now number about 150, the bulk of them being recently transported elsewhere.

Eastern Question, the name given to the diplomatic and national interests affected by the gradual retrocession of the Turkish Empire in Europe, and the problem of disposing of the territory thus left, or presumably to be left. Bulgaria, Roumania, Servia, and Greece are the new states which have naturally arisen on the withdrawal of the Turkish power, and their history in connection with the respective policies of England, France, Austria, and Russia toward them is the history of the phases of the "Eastern Question" so far. The Crimean War of 1854–56 with the Treaty of Paris which followed after it, and the Russo–Turkish War of 1877–78 with the Treaty of Berlin, the Armenian massacres of 1896, and the Turko–Grecian War of 1897, are among the notable events connected with this subject.

Eastern Roumelia, a portion of the Turkish dominions in Europe lying on the south of Bulgaria, from which it is separated by the Balkan Mountains; area 13,500 sq. mi. The country is fertile, but agriculture is backward; wheat, wine, tobacco, etc., are produced; timber is abundant. The chief town is Philippopolis. E. Roumelia was constituted an autonomous province of Turkey by the Treaty of Berlin in 1878, but recently attached itself to Bulgaria. Pop. 975,000.

East India Company, a great English company, originally simply a trading association, which played an important part in the history of Hindustan. It was formed in 1590 in London, with a subscribed capital of about $150,000, for the purpose of trade with the East Indies. A charter was granted to it by Queen Elizabeth on Dec. 31, 1600, for fifteen years, renewable for a similar period. In this charter the company is styled the "Governor and Company of the Merchants of London trading into the East Indies." In 1609 the charter was renewed by James I, and made perpetual, reserving power to the crown to recall it at three years' notice. Additional power was granted to the company of seizing and confiscating ships and goods of contraband traders, either in the British dominions or in any of the places where they were authorized to trade. The charter, which expired in 1780, was renewed till 1791. The renewal act provided that the company, which was already bound to submit to the government all dispatches received from India, should submit for approval all dispatches proposed to be transmitted thither. In 1813 the charter was renewed on condition that the right of exclusive trade should be restricted to China, while the Indian trade should be thrown open to all British subjects. The renewal of the company's charter in 1834 took place amid continued opposition to their mercantile, and even to their legislative privileges. The stock was valued at $30,000,000, which was to bear interest at 10 per cent. and be redeemable after April 30, 1874, on payment of $60,000,000. The company was now fairly in liquidation,

and on the outbreak of the mutiny of 1857 it was felt indispensable to vest the government of India directly in the crown, and this was accordingly done in 1858. Henceforth the company existed only for the purpose of receiving payment of its capital, and of the dividends due upon capital until its repayment.

East Indies, the name loosely applied to Hindustan, the Indo-Chinese peninsula, and a portion of the Eastern Archipelago, but excluding the Philippine Islands, New Guinea, and Australia.

East Liverpool, Columbiana co., O., 14 mi. n.w. of Pittsburg; has two national banks, two weekly papers, manufactories, potteries, etc. Pop. 1900, 16,485.

East Orange, Essex co., N. J., adjoining Newark. Railroads: Delaware, Lackawanna & Western; and Watching branch of Erie. East Orange is one of the residence suburbs of New York, 12 mi. distant. Not important as a manufacturing or business center, but has a number of pharmacal, watch-case, electrical, and other manufacturing establishments. Although a township in name, it is organized under a general charter and special laws, giving it city government under mayor and common council, and enjoys all city improvements. Pop. 1900, 21,506.

Easton, Talbot co., Md., near Avon River, 50 mi. s.e. of Baltimore. Railroads: D. & C. branch of the P. W. & B., and Baltimore, Chesapeake & Atlantic Ry. Industries: three flouring mills, three iron foundries, fertilizer co., and several other small factories. The town was first settled about 1550 and became a town in 1788. Pop. 1900, 3,074.

Easton, Northampton co., Pa., on Delaware River, at the mouth of the Lehigh River, 67 mi. n. of Philadelphia. Railroads: D. L. & W.; Lehigh Valley; Cent. of N. J.; Bang. & Port. Industries: flour mills, furniture factories, iron, pulp, cotton, wire, and planing mills, foundries, and blast furnaces. Lafayette College is situated here. Pop. 1900, 25,238.

East River, a strait in New York, separating New York from Brooklyn, and connecting Long Island Sound with New York Bay, about 20 mi. long. A great suspension bridge crosses between New York and Brooklyn.

East Saginaw, a city of Mich., located on the navigable river Saginaw, about 17 mi. from its mouth in Saginaw Bay (Lake Huron), nearly opposite Saginaw. It has a large trade and important manufacturing industries.

East St. Louis, St. Clair co., Ill., on Mississippi River, across the river from St. Louis and connected with it by Eads's bridge. Seventeen railroads have termini here. Industries: several iron companies, three flouring mills, cotton mill, three farm-implement factories, and about twenty others of various kinds. Surrounding country agricultural and coal mining. The town was first settled in 1765 by Richard Mc Carty, and was known as the Mc Carty tract; laid out in 1815 as Jacksonville, changed to Illinoistown in 1817, incorporated in 1859, and became the city of East St. Louis in 1865. Pop. 1900, 29,655.

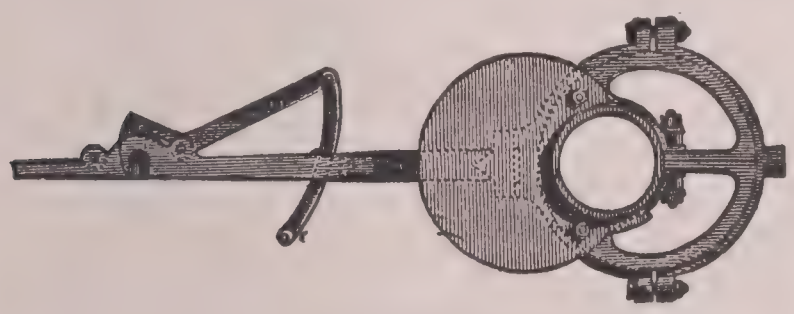
Eaton, John H. (1790–1856), statesman, b. in Tennessee. He was U. S. senator from Tenn., and secretary of war under General Jackson. Later he became territorial governor of Florida, and was minister to Spain 1836–1840.

Eau Claire (ō klār), Eau Claire co., Wis., on Chippewa and Eau Claire rivers, 85 mi. from St. Paul. Railroads: Northwestern; C. M. & St. Paul; and Wisconsin Central. Industries: two flouring mills, two iron foundries, one woolen mill, and a number of other factories. Surrounding country agricultural and mineral. Eau Claire was the scene of an Indian raid in 1858, repelled by Hon. W. P. Bartlett. The town was first settled in 1855, and became a city in 1872. Pop. 1900, 17,517.

Ebena′ceæ, a natural order of exogenous plants, consisting of trees and shrubs, of which the wood is very hard, and frequently of very dark color in the center, as ebony. The leaves are alternate, and generally coriaceous and shining; calyx monosepaleous and persistent, with three or six equal divisions; corolla monopetalous, with imbricated divisions. The fruit is a globular berry containing a small number of compressed seeds.

Eb′ony, the popular name of various plants of different genera, agreeing in having wood of a dark color. The most valuable is the heart-wood of *D. Ebenus*, which grows in great abundance in the flat parts of Ceylon, and is of such size that logs of its heart-wood 2 ft. in diameter and from 10 to 15 ft. long are easily procured. Other varieties of valuable ebony are obtained from *D. Ebenaster* of the East Indies and *D. melanoxylon* of Coromandel. Ebony is hard, heavy, and durable, and admits of a fine polish or gloss. The most usual color is black, red, or green. The best is jet black, free from veins, very heavy, astringent, and of an acrid pungent taste. On burning coals it yields an agreeable perfume, and when green it readily takes fire from its abundance of fat. It is wrought into toys, and used for mosaic and inlaid work.

Eccen′tric, a term in mechanics applied to contrivances for converting circular into reciprocating rectilinear motion, consisting of



Eccentric.

variously shaped discs attached to a revolving shaft not in their center. An *eccentric wheel* is a wheel fixed on an axis that does not pass through the center. Its action is that of a crank of the same length as the eccentricity.

Ecclesias′tes (-tēz), the title by which the Septuagint translators rendered the Hebrew *Coheleth* ("the gatherer of the people"), a symbolic name explained by the design of the book and the dramatic position occupied by Solomon

in it, one of the canonical books of the Old Testament. According to Jewish tradition it was written by Solomon; but the best modern criticism has decided that its style and language, no less than its thought, belong to a much later date.

Ecclesias′ticus, the title of a book placed by Protestants and Jews among the apocryphal writings. The author calls himself Jesus the son of Sirach. Originally composed in Aramaic, the book was translated into Greek by the grandson of the original author about the third century B. C.

Echeneis (ek-e-ne′is), a genus of fishes, family Scomberidæ or mackerels, having a disc on the head by which the fish can attach itself firmly to a solid object.

Echidna (ē-kid′na), a genus of Australian toothless mammals, in size and general appearance resembling a large hedgehog, excepting that the spines are longer, and the muzzle is protracted and slender, with a small aperture at the extremity for the protraction of a long flexible tongue. The habits of the Echidna

Echidna.

are nocturnal; it burrows, having short strong legs with five toes, and feeds on insects, which it catches by protruding its long sticky tongue. It is nearly allied to the Ornithorhynchus, the two forming a peculiar class of animals, having in their structure some peculiarities at once of mammals, birds, and reptiles.

Echinocactus (e-kī′-) a genus of cactaceous plants inhabiting Mexico and South America, and remarkable for their peculiar forms, being globular, oblong, or cylindrical, and without leaves, fluted and ribbed, with stiff spines clustered on woolly cushions. Some of them are very bulky. The flowers are large and showy.

Echinodermata (e-kī-nō-dėr′ma-ta), a class or subkingdom of invertebrate animals characterized by having a tough integument in which lime is deposited in granules (as in the starfish and sea cucumber), or so as to form a rigid test or shell like that of the sea urchin; and by the radial arrangement of many of the parts of the adult; though this is not necessarily carried out in the digestive and reproductive systems. They are provided with an apparatus for water circulation opening into the *ambulacra* or tubular feet, which are put into use by being distended with fluid. Some of them, as the encrinites or sea lilies, are permanently fixed by a stalk when adult.

Their development is accompanied with metamorphosis, and the embryo shows a distinctly bilateral aspect, though the radiate arrangement prevails in the adult. By some they are classed with the Scolecida in the subkingdom Annuloida. The sexes are distinct.

Echinus (e-kī′nus), Sea Urchin, or Sea Egg, a genus of marine animals, the type of an order of the class Echinodermata. The body is more or less globular and covered with a test or shell, often beset with movable spines. Locomotion is affected by a singular system of ambulacra or "tube-feet," which are distended with water, protruded through pores, and again retracted. The mouth is situated on the inferior surface, generally in the center, is armed with calcareous teeth, and opens into a gullet conducting to a distinct stomach. The stomach has issue into a convoluted intestine which winds round the interior of the shell and terminates in a distinct anus. The anus varies in position, being sometimes on the apical disc and sometimes marginal.

Echo (ek′ō), the repetition of a sound caused by the reflection of sound waves at some moderately even surface, as the wall of a building. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point of issue. Sound travels about 1,125 ft. in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. As the distance decreases the echo repeats fewer syllables till it becomes monosyllabic. The most practised ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than 60 ft. is needed to enable a common ear to distinguish between the echo and the original sounds. At a near distance the echo only clouds the original sounds, and this often interferes with the hearing in churches and other large buildings. Woods, rocks, and mountains produce natural echoes in every variety, for which particular localities have become famous. In Greek mythology, Echo was a nymph (one of the Oreads) who fell in love with Narcissus and because he did not reciprocate her affection she pined away until nothing was left but her voice.

Ecija (ā′thē-*hà*), an ancient town of Southern Spain, province of Seville, on the Genil, with manufactures of textile fabrics and a good trade. It is one of the hottest places in Spain. Pop. 24,955.

Eck, Johann Mayr von (1486–1543), the celebrated opponent of Luther. He went to Rome in 1520 and returned with a papal bull against Luther, in attempting to publish which he met with violent opposition. In 1530, while at the diet of Augsburg, he made the remarkable admission that he could confute the Augsburg Confession by the fathers but not by the Scriptures.

Eckford, Henry (1775–1832), naval architect, b. in Scotland, and d. in Turkey. In 1746, he established himself as a ship builder in New York City. He was employed by the U. S. government during the War of 1812, to construct vessels-of-war for the lakes and inland waters. Mr. Eckford became U. S. naval constructor in 1820, at the Brooklyn navy yard, where, under his direction, the government built six ships of the line, of which the *Ohio* became the most noted. In 1831 he built a sloop-of-war for the Turkish navy, and was preparing to enter the service of that government as chief naval constructor when he died.

Eclec′tics (Greek, *eklektikos*, select) is a name given to all those philosophers who do not follow one system entirely, but select what they think the best parts of all systems. In this century the eclectic method found a notable supporter in the French philosopher, Victor Cousin.

Eclipse (ek-lips), an interception or obscuration of the light of the sun, moon, or other heavenly body by the intervention of another and non-luminous heavenly body. Stars and planets may suffer eclipse, but the principal eclipses are those of the sun and moon.

An Eclipse of the Moon is an obscuration of the light of the moon occasioned by an interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is on that side of the earth which is turned away from the sun, and directly opposite, that it can come within the earth's shadow. Further, the moon must at that time be in the same plane as the earth's shadow; that is, the plane of the ecliptic in which the latter always moves. But as the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it frequently happens that though the moon is in opposition it does not come within the shadow of the earth.

An Eclipse of the Sun is an occultation of the whole or part of the face of the sun occasioned by an interposition of the moon between the earth and the sun; thus all the eclipses of the sun happen at the time of the new moon. An eclipse of the sun begins on the western side of his disc and ends on the eastern; and an eclipse of the moon begins on the eastern side of her disc and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon.

Eclip′tic, the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from west to east —really corresponding to the path which the

earth describes. The Greeks observed that the eclipses of the sun and moon took place near this circle; whence they called it the *ecliptic*. The ecliptic has been divided into twelve equal parts, each of which contains 30°, and which are occupied by the twelve celestial signs or constellations, called signs of the *zodiac*, the zodiac being a belt of the heavens extending 9° on each side of the ecliptic. The plane of the ecliptic is that by which the position of the planets and the latitude and longitude of the stars are reckoned. The points at which the equator and ecliptic intersect are subject to a continual variation, receding westward at the rate of about 50 seconds a year. The angle at which the ecliptic stands to the equator is also variable, and has been diminishing for about 4,000 years at the rate of about 50 seconds in a century. Laplace showed, however, that this variation has certain fixed limits, and that after a certain time the angle will begin to increase again. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle round a certain point; but this movement is so slow that it takes many thousand years to complete it.

Ecuador (ek-wȧ-dōr), a republic of South America, situated under the equator (whence it takes its name) between Peru and Colombia; area 118,630 sq. mi.; pop. 1,271,860. The country is divided into a number of provinces, and falls, as regards the surface, into three sections: the comparatively narrow and low-lying coast regions, the mountain region, and the extensive plains on the east. The mountain region is formed by a double range of snow-clad mountains—several of them active volcanoes—which inclose a longitudinal valley or table-land, with a breadth of 20 to 40 mi., and varying in elevation from 8,500 to 13,900 ft. The most elevated of these mountains are, in the western range, Chimborazo, Pichincha, and Cotacachi,—Chimborazo being 20,703 ft. high. In the eastern range are Cayambe, Antisana, and Cotopaxi (19,500). The cultivated land and the population of Ecuador lie chiefly in this elevated region, which extends along between the summits of the Cordillera, and may be considered as divided by transverse ridges or dikes into the valleys of Quito, Hambato, and Cuenca. The chief towns here are Quito, the capital, with a pop. of 80,000; Riobamba, and Cuenca, all situated at a height of 9,000 ft. or more above the sea. The chief ports of Ecuador are Guayaquil and Esmeraldas. The most considerable rivers, the Tigre, Napo, Pastaza, etc., belong to the basin of the Amazon; and some of them, notably the Napo, are navigable for long distances. On the western slope of the Andes the chief rivers are the Esmeraldas and Guayaquil. Ecuador is comparatively poor in Mammalia; although various kinds of deer as well as tapirs and peccaries are found in the forests. Parrots and humming birds are also numerous, but perhaps the most remarkable of the birds in Ecuador is the condor, which dwells on the slopes of the

Andes. Reptiles, including serpents, are numerous. The forests yield cinchona bark, caoutchouc, sarsaparilla, vegetable ivory, etc. The climate on the plains, both in the east and the west, is moist, hot, and unhealthy. In the higher regions the climate is rough and cold, but in great part the elevated valleys, as that of Quito, enjoy a delightful climate. Here the chief productions are potatoes, barley, wheat, and European fruits. In the lower regions are grown all the food products of tropical climates—cacao, coffee, sugar, etc. The foreign commerce is not large, the exports and imports being annually about $7,500,000 each. Cacao forms three-fourths (or more) of the whole export; the remainder is made up of coffee, hides, vegetable ivory, caoutchouc, etc. The mining and manufactures of Ecuador are insignificant. The people are poorly educated. The religion is exclusively Roman Catholic. The executive government is vested in a president elected for four years, who is assisted by a council of state. The congress is the legislative body, and consists of two houses, one formed of senators, two for each province, the other of deputies, one for every 30,000 inhabitants, both elected by universal suffrage. The congress has extensive privileges, and cannot be dissolved by the president. The seat of government is at Quito. In recent years the revenue and expenditure have been about $4,000,000 to $4,500,000 each. The total debt amounts to about $11,000,000. The money unit is the *sucre*, equivalent to 69 cents, but the coins of the U. S., France, and Britain circulate. Railways and telegraphs have made little progress. Ecuador, at the time of the conquest of Peru by the Spaniards, formed part of the great empire of the Incas. It was erected first into a viceroyalty of Peru, then (from 1564 to 1718) into an independent presidency. From 1718 it became part of the presidency of New Granada. In the revolutionary war against Spain Ecuador, along with the neighboring territories, secured its independence (1822), and was ultimately erected into a separate republic in 1831. Of the present population, the aboriginal red race form more than half; the rest are negroes, mulattoes, mestizoes, a degenerate breed of mixed negro and Indian blood, and Spanish Creoles or whites. The latter are the chief possessors of the land, but are deficient in energy.

Edda (meaning "great-grandmother"), the name given to two ancient Icelandic works, the one consisting of mythological poems, the other being mainly in prose. The first of these collections, called the *Older* or *Poetic Edda*, was compiled in the thirteenth century. The *Prose Edda*, or *Younger Edda*, presents a kind of prose synopsis of the Northern mythology; a treatise on the Scaldic poetry and versification, with rules and examples; and lastly a poem (with a commentary) in honor of Haco of Norway (d. 1263).

Eddy, Clarence, organist and composer, b. at Greenfield, Mass., 1851. At the age of seventeen he was apprenticed to his father, a contractor and builder, and devoted his time to

the study of architecture. He studied at Hartford, Conn., under Dudley Buck, and in Germany under August Haupt and others. On his return to the U. S. in 1875 he was made organist of the First Congregational Church of Chicago, and later held the same position in the First Presbyterian Church of that city. He has been director of the Hershey School of Musical Art since 1877. He gave concerts at the Paris International Exhibition in 1889. He has quite a reputation as an author and has published a collection, *The Church and Concert Organist*, and a translation, *Theory of Counterpoint and Fugue by Haupt.* He was made a member of the St. Cecilia Academy at Rome in 1896.

Edentata (ē-) (or Toothless Animals), the name of an order of Mammalia, though only two genera of the order want teeth, the ant-eaters and the pangolins. The remainder are merely destitute of teeth in the front of the jaws. The teeth they possess, however, are destitute of enamel, do not have complete roots, and are not replaced by a second set. This order is also characterized by the presence of great claws surrounding the ends of the toes, and more or less approximating to the nature of hoofs. It is divided into two sections, the first comprehending the sloths, which subsist on vegetable food, and the gigantic fossil animals, Megatherium and the Megalonyx; and the second including the armadillos and the ant-eaters, which live mainly on insects, though some of the armadillos eat other sorts of animal food, and also vegetables.

Ed′gar (The Peaceable), one of the most distinguished of the Saxon kings of England, was the son of King Edmond I. He succeeded to the throne in 959, and managed the civil and military affairs of his kingdom with great vigor and success. In ecclesiastical affairs he was guided by Dunstan, and he was a great patron of the monks.

Edgar Atheling, grandson of Edmund Ironside and son of Edward the Outlaw, was b. in Hungary. After the battle of Hastings, Edgar was proclaimed king of England by the Saxons, but made peace with William and accepted the Earldom of Oxford. Having been engaged in some conspiracy against the king he was forced to seek refuge in Scotland, where his sister Margaret became the wife of Malcolm Canmore. Edgar subsequently was reconciled with William and was allowed to live at Rouen, where a pension was assigned to him. Afterward with the sanction of William Rufus he undertook an expedition to Scotland for the purpose of displacing the usurper Donald Bane, in favor of his nephew Edgar, son of Malcolm Canmore, and in this object he succeeded. He afterward took part in Duke Robert's unsuccessful struggle with Henry I, but was allowed to spend the remainder of his life quietly in England.

Edgewater, N. Y., is on Staten Island, near the village of Stapleton. It has various manufactories. It is now a part of the Borough of Richmond, Greater New York.

Edgeworth, Maria (1767–1849), a celebrated authoress. Her first novel *Castle Rackrent*, a tale of Irish life, published in 1801, immediately established her reputation. This was followed by a long series of novels, moral tales, popular tales, etc., among which may be mentioned *Belinda*, *Leonora*, *Ennui*, *The Absentee*, *Helen*, etc.

Ed′inburgh, the metropolis of Scotland. It is picturesquely situated, being built on three eminences which run in a direction from east to west, and surrounded on all sides by lofty hills except on the north, where the ground slopes gently toward the Firth of Forth. The central ridge, which constituted the site of the ancient city, is terminated by the castle on the w., situated on a high rock, and by Holyrood House on the e. not far from which rise the lofty elevations of Salisbury Crags, Arthur's Seat (822 ft. high), and the Calton Hill overlooking the city. The principal street of the Old Town is that which occupies the crest of the ridge on which the latter is built, and which bears at different points the names of Canongate, High Street, Lawnmarket, and Castle Hill. This ancient and very remarkable street is upward of one mile in length, rising gradually with a regular incline from a small plain at the east end of the town, on which stands the palace of Holyrood, and terminating in the huge rock on which the castle is built, 383 ft. above sea-level. The houses are lofty and of antique appearance. Among the notable buildings are the ancient Parliament House, now the seat of the supreme courts of Scotland; St. Giles's Church, or Cathedral, an imposing edifice in the later Gothic style, recently carefully restored; the Tron Church; Victoria Hall (where the General Assembly of the Established Church meets), with a fine spire; the Bank of Scotland, etc., besides some of the old family houses of the Scottish nobility and other buildings of antiquarian interest. In the Old Town the most remarkable public building is the castle. In an apartment here is kept the ancient regalia of Scotland. No part of the present palace is older than the time of James V (1528). In the n.w. angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. The Advocates' Library, the largest library in Scotland, contains upward of 250,000 printed volumes and 2,000 MSS. It is one of the libraries entitled to a copy of every copyright book published in Great Britain. Besides the buildings already noticed, Edinburgh possesses a large number of important edifices and institutions, chief among which are the Royal Institution (containing accommodation for various bodies), the National Gallery of Scotland, the Museum of Science and Art, the new Episcopal Cathedral of St. Mary's, etc. Edinburgh is the headquarters of the book trade in Scotland, and the seat of the chief government departments. The origin of Edinburgh is uncertain. Its name is thought to be derived from Eadwinsburh, the Burgh of Edwin, a powerful Northumbrian king, who absorbed

the Lothians in his rule. The town was made a royal burgh in the time of David I; but it was not till the fifteenth century that it became the recognized capital of Scotland. Pop. 261,261.

Edinburgh, Duke of, H. R. H., Prince Alfred Ernest Albert, K. G., K. P., Duke of Saxony and Prince of Saxe-Coburg-Gotha, the second son of Queen Victoria, was b. at Windsor Castle, Aug. 6, 1844. He was educated by special tutors, and at the age of fourteen joined the steam frigate *Euryalus* as naval cadet, and served on various foreign stations. In 1862 he declined the offer of the throne of Greece. On his majority he received $75,000 a year by vote from Parliament, and was created Duke of Edinburgh, Earl of Kent, and Earl of Ulster. In 1867 the duke was appointed to the command of the frigate *Galatea*. On Jan. 23, 1874, he married the Grand-duchess Marie, only daughter of the emperor of Russia. In 1882 he was made vice admiral, and has since held important commands.

Edison, Thomas Alva, inventor, b. at Milan, O., Feb. 11, 1847. His mother taught him to read, and he began work as a train boy on the Grand Trunk R. R. He learned printing and edited and printed the *Grand Trunk Herald* in the baggage car of the train on which he was employed. A station master whose child he had rescued taught him telegraphy. He was employed by the Western Union Telegraph Company, and there began the series of inventions which have brought him fame and fortune. As a telegraph operator he was noted for the skill and rapidity with which he transmitted messages. After brief sojourns in several Western cities he settled in Boston. Carrying on his experiments there he was able to overcome the difficulties connected with sending two messages in opposite directions at the same time, over the same wire, and invented the duplex telegraph which is highly valued, as it saves expense in the construction of lines. In 1868 he happened to be in New York when the indicator at the Gold and Stock Exchange broke down. He volunteered his services and succeeded in adjusting the instrument. He moved to New York City in 1871. His laboratories were first located at Menlo Park, N. J., and later he established headquarters at Orange, N. J. A score of skilled investigators assist him, and under his leadership invention has been reduced to an art. He has taken out nearly 400 patents, 29 of these issued in one week. He devotes himself mainly to electricity, but he has had marked success in other lines. His most valuable inventions have been patented in other countries as well as in America. Some of his most noted inventions are: the *Phonograph*, an instrument for making permanent records of articulate sounds; the *Microphone*, which detects the faintest sound; the *Megaphone*, by the aid of which ordinary sounds can be heard at a great distance; the *Microtasmeter*, which records minute variations in temperature. His *Incandescent* lamp combines purity, steadiness, safety, and simplicity, in manipulation. The *Kinetoscope*, which is one of his latest inventions is, as its name indicates, an apparently moving panorama, or machine for throwing moving pictures. Edison clearly holds the foremost position among inventors of the nineteenth century.

Ed'monton, a town in England, county of Middlesex, 7½ mi. n. of London, with an extensive trade in timber, carried on by the Lea River navigation. The "Bell at Edmonton" has become famous by association with the adventures of Cowper's John Gilpin. Pop. 25,380.

Edmund I, king of England, succeeded his brother Athelstan in 940. He conquered Cumbria, which he bestowed on Malcolm, king of Scotland, on condition of doing homage for it himself. He was slain at a banquet, 946.

Edmund II (989–1016), surnamed *Ironside*, king of England, was the eldest son of Ethelred II. He was chosen king in 1016, Canute having been already elected king by another party. He won several victories over Canute, but was defeated at Ashingdon, in Essex, and forced to surrender the midland and northern counties to Canute. He d. after a reign of only seven months.

Edmunds, George Franklin, b. in Richmond, Vt., Feb. 1, 1828. He became a lawyer, and was a representative in the legislature (1854–1859), serving three years as speaker. In 1861 he was elected to the state senate, and in 1866 became United States Senator, which office he held by constant re-election until 1891. Senator Edmonds has been president *pro tem.* of the senate, and a member of many important committees. He favored the reconstruction laws, and framed a bill—known by his name—for the suppression of polygamy in Utah. He was a candidate for the presidential nominations in the Republican national conventions of 1880 and 1884.

Edom, in the New Testament *Idumæa*, in ancient times a country lying to the south of Palestine. The Edomites are said in Genesis to be the descendants of Esau, who was also called Edom (a word signifying "red"), and who dwelt in Mount Seir, the mountain range now called *Jebel Shera*, stretching between the Dead Sea and the Gulf of Akabah. The chief city in this region was Petra, which now presents remarkable ruins, rock-cut temples, etc.

Edred, king of England, son of Edward the Elder, succeeded to the throne on the murder of his brother, Edmund I, in May, 946.

Education (Lat. *educo*, "I lead forth") is the *science* of human culture and the *art* of training the faculties of man to their best uses and their highest results. By it the young are prepared for the proper fulfillment of the duties of civilized life. Man is the true "Wealth of Nations," and education seeks to realize all that is in man as man. It aims at securing the healthy growth and due development of all the activities of the body, mind, and will, so that each person may be able to have a fair start in life and to act well, as members of the community, under a right sense of all life's responsibilities. The teacher molds what is plastic, trains

what is pliant, exercises all the innate and actual powers of his pupils. As such, education presents itself in three aspects: 1, hygienic, 2, mental, and 3, moral or religious. It shows us how, 1, to nourish the child in bodily health and to cherish in it feelings of love and goodness, with a knowledge of right and duty; 2, to awaken and exercise the mind's perceptions of nature and conceptions of truth; 3, to inform the intellect and habituate it to know, admire, desire, and do what is right; 4, to enlighten and discipline the conscience, and at length incline and enable it to feel, think, and act as a responsible moral agent.

When considered as an applied science education comprises the following parts: 1, *Primary* or Elementary, including reading, the means of acquiring a knowledge of the thoughts of others by signs; writing, the means of communicating our thoughts to others by signs; arithmetic, the means of computing, by signs, the numbers and quantities of things; object lessons and history—by the former we are taught something of nature above, below, and around us, as well as the laws by which it is regulated; and by the latter we gain some knowledge of the race to which we belong, its doings, duties, and hopes. 2, *Disciplinary* or Secondary—all that improving information which goes to make a man able and wise, the *gymnastics* of the mind, e. g., grammar, physiography, mathematics, literature, classical training, health science, political and social economy, and the practical acquisition of modern languages. 3, *University* or Liberal Studies —all that superior culture designed to make thought a pleasure and learning a refining delight. 4, *Professional*—those branches of knowledge which are necessary for exercising the higher vocations, e. g., of artist, author, diplomatist, journalist, lawyer, linguist, merchant, physician, preacher, statesman, scientist, teacher, etc. 5, *Technical* or Industrial, manufacturing and artistic—the special training required in agriculture, arts, commerce, engineering, and manufactures. 6, *Supplementary*, under which may be ranged all those studies and pursuits which are of interest to the individual and for the time, as biography, numismatics, bibliography; those gratifying to the curiosity, or the taste, as archæology, conchology, æsthetics; those calculated to bring men together sympathetically from a common bent of mind, fancy, or hobby; as well as the ordinary every-day information required in common life, such as is stored up in almanacs, classified in handbooks, and met with in newspapers.

A somewhat more scientific or theoretical outline of education or systematic pedagogy arranges its matter into these groups: 1, *Physical*—that which makes and keeps the body healthy; trains it to usefulness, pliancy, and elegance; and induces, by gymnastic drill and athletic exercises, skill of muscle and nerve, acuteness of sense, and handy readiness of frame. 2, *Instrumental*—(*a*) elementary, as reading, writing, and arithmetic; (*b*) technical, as drawing, a knowledge of the use and manipulation of objects, products, machinery, etc.; (*c*) mental: words and their uses, composition, bookkeeping, etc.; (*d*) professional: the arts and duties of business, office, factory, workshop, warehouse, field, or shipboard. 3, *Informing*, as grammar, geography, history (civil and natural), government, taxation, finance, the progress of events, and an acquaintance with topics of every-day interest and necessity. 4, *Culturing*, as logic, rhetoric, mathematics, science (physical and social), philosophy (ethical, mental, and political), statistics, language, and literature (ancient and modern), criticism, etc. 5, *Moral*, i. e., relating to duty (personal, family, civil, social, or legal). 6, *Political*, concerning the rights and responsibilities of citizenship in private, public, or official life. 7, *Philosophical*, in regard to (*a*) the theory of life, thought, and action, and the legislation founded on it; (*b*) scientific ethics and sociology, the history of systems of thought on man, life, and society. 8, *Æsthetic*, (*a*) the knowledge, practise, and enjoyment of the fine arts; (*b*) the perception of the sublime and the beautiful, and the delight derived from natural scenery; (*c*) the nature, uses, and pleasures of poetry and imaginative literature. 9, *Religious*, dealing with (*a*) personal piety; (*b*) public worship, and the rights and duties of fellow worshipers; (*c*) the special duties of members, adherents, and officials in relation to their own and other creeds; (*d*) social efforts and home influence, etc.; (*e*) missionary enterprise (home and foreign); (*f*) individual example, state regulations, and church arrangements; (*g*) public worship or national recognition of God. A theory of education may also be presented to the mind in (*a*) its nature, (*b*) its form, and (*c*) its limits; in its particular elements, as (*a*) physical, (*b*) practical, and moral, and (*c*) intellectual; and in its special systems, as (*a*) theocratic, (*b*) national, or (*c*) humanitarian. These are next found dealing with (*a*) personal culture, (*b*) special callings, (*c*) the duties of home and citizenship.

History.— The history of education leads us to trace the means employed in the training of children under patriarchal rule, as in the earlier races of the earth; in the family circle, as in China; in tribes, as among many savage people; in castes, as in India and other Oriental lands; for military purposes mainly, as in Persia, or for priestly ones, as in Egypt and among the Celtic Druids. It was pursued in ancient Greece with a philosophical design, and in Rome with a practical one. In mediæval Europe and in modern Thibet an ecclesiastical bent prevailed; in America, Germany, and France a political intent to a large extent regulates it. It has not been pursued in the past with the single object of making the best of a man for himself, and doing the best with him in society — as the culture of life. Hence we require to trace its course through slight indications of facts brought together and arranged by a few theoretical links. In the primitive forms of life the chief lessons of the young would be to obey at home, to help with the flocks or toil in the fields, and to refrain from offenses against parents, friends, and neigh-

bors. So long as pastoral and agricultural occupations prevailed, this or little more sufficed. In the dawn of civilization only the priests and their assistants required mental training and moral culture. Hieroglyphics wrapped up their professional secrets for cure of body and for care of soul. Among the Jews the schools of the prophets were training colleges for the brighter minds among the people of Palestine.

After Solomon had wisely advised the Israelites "to train up a child in the way he should go," some mode of education seems to have been adopted. The Greeks looked on strength of sinew and beauty of body as of vast importance. A highly educated priesthood existed both in Greece and Rome. Learning, however, was not confined to that class. The love of wisdom, philosophy, was the leading mark of the Hellenic race. Their zeal for culture called forth a class of teachers, the sophists, who popularized the knowledge and fashioned the opinions of their ages. Socrates taught men to exercise their minds for the discovery of truth. Athens became the university of Rome. Schools existed in Italy for instruction in reading, writing and arithmetic; but Greek was the language of culture. Ability and pliability formed, in their ideal, a complete man; and hence they advocated dexterity in the elementary subjects, readiness in speech, and knowledge of myths, legends, poetry, and history. The pedagogue regulated life and manners; the schoolmaster inculcated instruction and exercised the mind; the father governed the character and will. In this Rome imitated Greece.

The Christian church received from its founder the command to "teach all nations." In this lay the germ of popular education. All the great schools and communities of scholars were connected with the church and its missions. During the Middle Ages the clergy and the laity were clearly distinguished. The monks were taught that and what they might teach; grammar, logic, and rhetoric, music, arithmetic, geometry, and astronomy. The knight was taught to ride, fence, shoot, swim, box, hawk, play chess, and sing love songs to his lute and his lady. The toiling masses tilled the soil and wrought at handicrafts. The merchant classes established guilds. Charlemagne, desiring to rule over an enlightened people, set schools afoot in the chief cities of his empire. He enjoined the bishops to see that the children in their dioceses were learned in grammar, arithmetic, music, and gospel truth. Greek poetry was committed to memory, and astrology was a favorite pursuit. The institution of universities and the cultivation of modern tongues; the culture in writing, the multiplication of books, the study of the Roman law, and the need which thus arose for a renewed examination of the Latin language, excited the minds of men and increased the number of those who sought knowledge. Learning revived.

When printing made books readily accessible schools increased rapidly. Scholars like Erasmus passed from land to land, carrying the

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torch of knowledge as they went. Luther's appeal from pope to people carried the need of learning into the cottage. In most other lands education was dealt with mainly as a minor branch of religion and an outlet for benevolence. Schools were mostly benefactions or church pertinents. Montaigne insisted that "we have not to train a soul, nor yet a body only, but a man," and he objected to giving children "a smattering of everything in general, but nothing to the purpose in particular." The practical systems of instruction pursued by Valentine Trotzendorf of Goldberg and John Sturm of Strasburg became the models on which the grammar or classical schools of Germany were formed. Wolfgang von Ratich proposed an improved school system to the German diet (1612). J. A. Comenius, an Austro-Slav and a Moravian brother, devoted his life to improving the instruction and discipline of schools, and making man through them surely, easily, and solidly wise and holy. He is the chief of modern didactic educationists. Milton, through Hartlib, had been led to study Comenius, and to compose his *Tractate on Education.* The Commonwealth Parliament entertained the idea of endowing a universal college for "the advancement of learning" on Bacon's ideal. Then the times changed and enthusiasm waned. John Locke's *Thoughts on Education* (1690), though discursive and irregular, advocates the careful development both of body and mind in manliness, wisdom, and virtue. Defoe, about 1692, in an *Essay on Projects* protested against making women "only stewards of our houses, cooks, and slaves;" and said, "The soul is placed in the body like a rough diamond, and must be polished or the luster of it will never appear. And it is manifest that as the rational soul distinguishes us from brutes, so education carries on the distinction, and makes some less brutish than others." A century and a quarter elapsed before these thoughts ripened into legislation in England.

Meanwhile *Emile,* a romance of education, by J. J. Rousseau, which maintained that man should have a strong, serviceable body, well-trained muscles and nerves, and ought not to be required to obey, but be led by comradeship, grew into encyclopedism and the Revolution in France, and roused men to consider anew the nature and need of education. Kant philosophized on *paideutics*; Goethe in *Wilhelm Meister* supplied his ideal of training a living mind for living its life aright; Fitche explained "the vocation of man" and of "the scholar" to be "duty, intelligence, and effectiveness." Pestalozzi, stirred by *Emile,* proclaiming that vice and misery arose from ignorance, entered on a crusade against their cause. He moved Europe to undertake in some fashion the cultivation of souls as well as soils, and education became the enthusiasm of the age. Froebel founded the kindergarten. The worth of man as an article of culture, and of education as a national industry, gained public attention.

United States.—In the early national legislative recognition of education America holds a

distinguished place. Here universal suffrage and universal education condition each other, and the culture of humanity is brought within the sphere of the state. One of the earliest Education Acts of the original colonists of Massachusetts Bay, incorporated in 1628, was passed in 1632. It required householders to give "their children and apprentices as much learning as would make them able to read perfectly the English tongue, and know the capital laws," which they were bound to obey. A law making the support of schools compulsory and education free and universal was enacted in 1647. This was confirmed in 1692, reaffirmed in 1780, and expressly made a state law in 1789. An appropriation either in taxes or in land, is set aside in each school district for the proper and adequate provision of instruction in each township, and since 1835 a permanent fund for the support and encouragement of education has been established. The management of this fund was by the legislature entrusted to a board of education in 1837. This has formed the model on which the Atlantic, the Central, the Western, the Pacific Coast, and the Southern states, have all, though at more recent dates and with several slight differences, molded their school system. The plan is so elastic and expansive, in regard to course of studies and thoroughness of instruction, that it may be utilized in all places and adapted to all wants. The state demands that suitable schools shall exist and be maintained in a given population. It leaves the nature of the school buildings, the choice of teachers, the supply of books, and the oversight of the instruction in the hands of the local committee; and though it decrees that children must be taught, it leaves the enforcement of the law mainly with the local administrators. In most cases the schooling is free, the Bible is read, but doctrines are not taught. The teachers are examined and certificated, generally by local boards. Normal training schools were instituted in Boston in 1839, and have multiplied greatly. Schools are usually open to boys and girls. The classing of schools has been found difficult, a closer community of interest among teachers and between teachers and their employers being required; and greater uniformity of administration has been aimed at, since the Civil War has made the Union more compact, and the benefit of education more felt and better appreciated. The American statistics of education are very complete, and the reports of the bureau of education highly valuable.

Europe.—Among the states of Europe, Prussia long enjoyed the highest reputation for the excellence of its provisions for the education of the people. Educational enactments prevail in Denmark, Switzerland, and the minor members of the German States' Confederation. Though in Austria and Hungary education has since 1849 been placed in charge of a minister of public worship and instruction, there are some peculiarities in which it differs from the German-speaking states. Boarding and technical schools are more numerous. Nearly

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the whole expense of instruction is provided for from general and local taxation, and is, through all grades, in the main gratuitous. Education is almost entirely under the management of the clergy, especially the Jesuits. France owes to a voluntary association, founded in 1815, the initiation of the present national system of popular education. It was organized as "a Society of Public Utility" in 1831. In the Netherlands each district must have at least one elementary school, supported by the local public funds. All teachers undergo examination before being permitted to teach, and all schools are under government inspection. Religious instruction is excluded from public schools, whether elementary or higher. Education in Russia has not yet been thoroughly nationalized. Village schools are upheld mainly by voluntary funds; the gymnasia in the provincial towns are in some cases endowed, in others supported from the imperial treasury. Poor students are allowed maintenance at these and at the universities. There is a minister of education, and many improvements in the diffusion, organization, and teaching of schools followed the abolition of serfdom. Since the union of the Italian peninsula into a kingdom great efforts have been made to increase elementary schools and to provide for adequate instruction in them. Normal schools have been established, and as teachers are prepared they are speedily placed out in the new public and endowed schools.

A social and political revolution in Japan, in 1868, led to the recognition of the importance of education. The new government established a bureau of education, introduced a number of teachers, and sent into different countries a select number of youths to be trained intellectually and technically. A large number of these, besides several English and American teachers, have been put in charge of schools. English is taught. America has been chosen as the model of their free schools and colleges. It took England a long time to exchange the idea that education is a charity to that of its being a right, a duty, and a safeguard, but it came to that at length. Eton was established by Henry VI in 1441; Westminster, prior to the time of Edward the Confessor, but as it now exists, by Queen Elizabeth, 1561; Charter-House, by Thomas Sutton, 1611; Rugby, by Lawrence Sheriff, 1567. These are endowed seminaries, in which are combined the characteristics of a boarding house and a school. Prior to the Reformation almost all schools were controlled by and in connection with the church, and most of them were grammar schools. From the Reformation until the present century endowed grammar schools supplied a liberal education to those who received their training in them. Early in the present century, Owen, Bentham, Brougham, Horner, James Mill, etc., advocated national education. When the Revolution and the Pestalozzi fervor excited men, various means were adopted to increase the quantity and improve the quality of instruction. The National Society for promoting the education of the

poor in the principles of the established church was founded in 1811. The compulsory educationists started a league at Birmingham, and the denominationalists a union at Manchester in 1869. The Society of Arts brought the chiefs of these bodies together at a conference in 1870. Public educational acts regulate: 1, the constitution, duties, and proceedings of school boards; 2, the appointment of officers and managers by the school boards; 3, the payment and remission of fees; 4, the purchase of sites; 5, the use of compulsory measures to secure attendance; and 6, fixes the tenure of the teacher at the discretion of the board, and arranges for his removal when necessary.

Education flourished in Ireland during the Middle Ages. The Celtic monasteries were centers of light. Their members devoted themselves to prayer, study, and the transcription of MSS. or the compilation of books. Missionary zeal excited eagerness for knowledge. Not only did the monks carry learning abroad, as St. Columban did; but scholars from every land and English students of all classes found hospitable welcome, food, books, and instruction in the schools of the saints. A training college for teachers of higher class schools has been established at Finsbury, and the education department now requires from all its certified teachers some knowledge of the history, theory, and practise of education. The Education Society, for examining and expounding the principles of education, was founded in 1875. The Teachers' Guild of Great Britain and Ireland has been founded (1884) to facilitate a closer co-operation among teachers, and with those who are educated in educational effort and progress.

Edward I, known as *the Elder* (870–925), king of England, son of Alfred the Great, succeeded his father in 901. His reign was distinguished by successes over the Danes. He fortified many inland towns, acquired dominion over Northumbria and East Anglia, and subdued several of the Welsh tribes.

Edward II, surnamed the *Martyr* (960–979), king of England, succeeded his father, Edgar, at the age of fifteen, in 975. His reign of four years was chiefly distinguished by ecclesiastical disputes.

Edward III, king of England, surnamed the *Confessor*, younger son of Ethelred II. On the death of his maternal brother, Hardicanute the Dane, in 1041, he was called to the throne, and thus renewed the Saxon line. Edward was a weak and superstitious, but well-intentioned prince, who acquired the love of his subjects by his monkish sanctity and care in the administration of justice. His queen was the daughter of Godwin, earl of Kent. He died in 1066, and was succeeded by Harold, the son of Godwin.

Edward, Prince of Wales (1330–1376), surnamed the *Black Prince*, the eldest son of Edward III and Philippa of Hainault. In 1346 he commanded part of the forces at the battle of Crécy, and earned the praise of his warlike father. In 1355 he commanded the army which invaded France from Gascony, and distinguished himself the following year at the great battle of Poictiers. By the Peace of Brétigny the provinces of Poictou, Staintonge, Périgord, Limousin, were annexed to Guienne and formed into a sovereignty for the prince under the title of the Principality of Acquitaine. A campaign in Castile, on behalf of Pedro the Cruel, and the heavy taxes laid on Acquitaine to meet the expenses, caused a rebellion, and ultimately involved him in a war with the French king. His own health did not allow him to take the field, and having seen his generals defeated he withdrew into England, and after lingering some time died, leaving an only son, afterward Richard II.

Edward I (1239–1307), king of England, son of Henry III, was born at Winchester. The contests between his father and the barons called him early into active life, and he finally quelled all resistance to the royal authority by the decisive defeat of Leicester at the battle of Evesham, in 1265. During his reign great progress was made in the establishment of law and order throughout the land.

Edward II (1284–1327), king of England, b. at Caernarvon Castle, and the first English Prince of Wales, succeeded his father, Edward I, in 1307.

Edward III (1313–1377), king of England, son of Edward II, by Isabella of France. On his father's deposition in 1327 he was proclaimed king under council of regency, while his mother's paramour, Mortimer, really possessed the principal power in the state.

Edward IV (1441–1483), king of England. His father, Richard, duke of York, was grandson of Edward, earl of Cambridge, and duke of York, fourth son of Edward III, while the rival line of Lancaster descended from John of Gaunt, the third son. The York line had intermarried with the female descendants of Lionel, the second son, which gave it the preferable right to the crown. Edward, on the defeat and death of his father at the battle of Wakefield, assumed his title, and having entered London after his splendid victory over the troops of Henry VI and Queen Margaret at Mortimer's Cross, in February, 1461, was declared king by acclamation.

Edward V, king of England (1470–1483), the eldest son of Edward IV, was in his thirteenth year when he succeeded his father in 1483. He fell into the hands of his uncle, the duke of Gloucester, who made himself king as Richard III and caused the young king and his brother to be sent to the Tower, where it is said, he had them smothered by ruffians.

Edward VI (1537–1553), king of England, son of Henry VIII, by Jane Seymour. At his father's death he was only ten years of age. His education was intrusted to men of the first character for learning, under whose training he made great progress and grew up with a rooted zeal for the doctrines of the Reformation. His reign was, on the whole, tumultuous and unsettled.

Edward VII, king of Great Britain and emperor of India, was born at Buckingham Palace,

Nov. 9, 1841, eldest son of Queen Victoria and Prince Albert. He studied for a session at Edinburgh, and entered Christ Church College, Oxford, and later resided for four terms at Cambridge. He visited Canada and the United States in the summer of 1860, and two years later traveled in the East. In 1863 he married Princess Alexandra, daughter of Christian IX of Denmark. He was elected Grand Master of the Freemasons of England in 1874 and admitted to the office at a lodge held at Albert Hall, South Kensington. In 1875–76 he traveled in India, and in 1885 made a tour through Ireland. He has always taken an active interest in sports, and scored several victories on the turf. He was proclaimed king upon the death of his mother, Queen Victoria, Jan. 22, 1901, and chose the name of Edward VII.

Edwards, AMELIA BLANDFORD (1831–1892), an English novelist. As far back as 1853 she began to contribute to periodicals. Among her best-known novels are *Hand and Glove; Half a Million of Money; Lord Brackenbury.*

Edwards, JONATHAN (1703–1758), a celebrated theologian and metaphysician, b. at East Windsor, Conn. He entered Yale College in 1716, and studied till 1720, in 1722 received a license as preacher. In 1723 he was elected a tutor in Yale College, but resigned in 1726 to be ordained as minister at Northampton, Mass. After more than 23 years of zealous service here he was dismissed by the congregation owing to the severity with which he sought to exercise church discipline. He then went as a missionary among the Indians at Stockbridge, in Massachusetts. Here he composed his famous work on the *Freedom of the Will,* a masterpiece of metaphysical argument. It appeared in 1754, and was completed within four months and a half. In 1758 he was chosen president of the college at Princeton, New Jersey, but d. shortly afterward.

Edwy, king of England, son of Edmund I, succeeded his uncle Edred in 955. Taking part with the secular clergy against the monks, he incurred the confirmed enmity of the latter. The papal party, headed by Dunstan, was strong enough to excite a rebellion, by which Edwy was driven from the throne to make way for his brother Edgar.

Eel, the general name of a family of teleostean fishes belonging to the apodal section of the Malacopterygii. They belong to various genera. The genus *Anguilla* is characterized by its serpent-like elongated body, by the absence of ventral fins, and the continuity of the dorsal and anal fins round the extremity of the tail. The dorsal fin commences half-way between the head and the anal fin, and the lower jaw projects beyond the upper. In the genus *Conger,* which is exclusively marine, the dorsal fin commences above the pectoral, and the upper jaw is the longer. The smoothness of the body—the scales being inconspicuous—and the serpentine movements of eels are proverbial. The conger and at least three other species—the sharp-nosed, the broad-nosed, and the snig—belong to Britain. The species of the sharp-nosed genus, which are both fresh-water and marine, seldom exceed 30 in. in length. Eels avoid cold, and frequently migrate in winter to the mud or brackish water of estuaries where the temperature is higher. They have even been met with in large numbers performing migrations on land, mostly intervening necks of soil covered with damp grass. Some eels spawn in the estuaries of rivers, and immense numbers of the young eels pass up the streams in spring, their passage in England being called the *eel-fare.* Eels are considered excellent food.

Effingham, Effingham co., Ill., 100 mi. e. of St. Louis. Railroads: Vandalia Line; Illinois Central; Wabash; and Indiana & Illinois Southern. Industries: two large flouring mills. Surrounding country agricultural. The town was first settled about 1845. Population 1900, 3,774.

Egbert, considered the first king of all England, was of the royal family of Wessex. He succeeded Brihtric in 802 as king of Wessex. He reduced the other kingdoms and rendered them dependent on him in 829, thus becoming their overlord. He d. in 839.

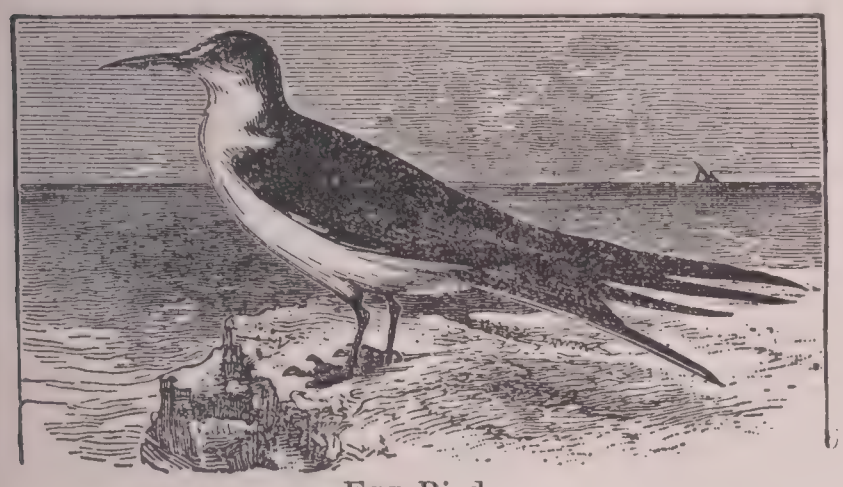
Ege'ria, a nymph who received divine honors among the Romans. Numa is said to have received from her the laws which he gave to the Romans.

Egg, a body specially developed in the females of animals, and in which, by impregnation, the development of the young animal takes place. Birds, reptiles, fishes, insects, and worms are oviparous, i.e., bring forth eggs or ova, as do also, among mammalia, the ornithorhynchus and echidna. The egg contains the germ of the young animal, as well as the substance which serves for its nourishment. All it needs for its development is external heat. The eggs of animals lower than the birds have usually only three parts, viz., the germinal spot or dot, the germinal vesicle, and the vitellus or yolk; the first being contained in the vesicle, and that again in the yolk. Besides these parts the eggs of birds have the white or albumen, and the shell, which consists of a membrane coated with carbonate of lime. The eggs of birds, especially of fowls, are a pleasant and nutritive food. The common domestic fowl, the turkey, the pea-hen, and the common duck produce the eggs which are commonest in the market. Among reptiles, turtles produce eggs which are good for eating. The eggs of fishes are their roe or spawn. A hen's egg of good size weighs about 1,000 grains, of which the white constitutes 600, the yolk 300, and the shell 100. When the white of an egg is warmed it coagulates to a firm opaque mass. Eggs form an important article in American commerce.

Egg-bird, a species of tern, a bird of considerable commercial importance in the West Indies, as its eggs, in common with those of two other species of tern, form an object of profitable adventure to the crews of numerous small vessels.

Eggleston, EDWARD, b. in Vevay, Ind., Dec.

10, 1837. His education consisted of a knowledge of Latin and some Greek, and an extensive acquaintance with the French language and literature, also Spanish and Italian. When nineteen years old he joined the Methodist ministry and preached for ten years. His literary career began in 1866, as editor of the *Little Corporal*, at Evanston, Ill. In 1870 he



Egg-Bird.

became literary editor of the *Independent*, in New York City. As he said, the purpose of his novels was to do "something toward describing life in the back country districts of the Western states." His principal novels are, *The Hoosier Schoolmaster*, *The End of the World*, *Roxy*, and *The Faith Doctor;* in history, *Household History of the U. S.*, *Eighty Famous American Indians*, etc.

Eggleston, GEORGE CARY, brother of Edward Eggleston, b. in Vevay, Ind., 1839. He was educated at Indiana Asbury University and Richmond College, Va. Later he practised law in Virginia and was a Confederate soldier throughout the Civil War. Later he became editor-in-chief of *Hearth and Home*, and in 1875, literary editor of the *Evening Post.* In 1889 he became editorial writer of the *World.* Among the books which he has published are, *A Rebel's Recollections; The Wreck of the Red Bird;* and *The Juggernaut.*

Eggplant, natural order Solanaceæ, an herbaceous plant, from 1 ft. to 18 in. high, with large white or purplish flowers. The fruit is about the size of a goose's egg, and generally yellow, white, or violet, and when boiled or stewed is used as an article of food. It is cultivated in India, the U. S., etc., and in European hothouses.

Eg'lantine, one of the names of the sweetbrier, a kind of wild rose. The name has sometimes been erroneously used for other species of the rose and for the honeysuckle.

Egmont, LAMORAL, COUNT (1522–1568), a famous Dutch patriot. He entered the military service, accompanied Charles V in his African expeditions, and distinguished himself under Philip II in the battles of St. Quentin and Gravelines. Egmont became involved in the political and religious disputes which arose between the Netherlands and their Spanish rulers. He tried to adjust the difficulties between both parties, and in 1565 went to Spain to arrange matters with Philip. In 1567 the Duke of Alva was sent with an

army to the Netherlands to reduce the insurgents. One of his first measures was to seize Count Egmont and Count Horn. After a trial before a tribunal instituted by Alva himself they were executed at Brussels.

E'goism, as a philosophical doctrine, the view that the elements of all knowledge and the reality of the things known are dependent on the personal existence of the knower. Hence the logical position of the egoist is to doubt the substantial reality of everything except his own existence.

E'gret, a name given to those species of white herons which have the feathers of the lower part of the back elongated and their webs disunited, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of common herons. The American egret is about 37 in. long to the end of the tail; plumage soft and blended; head not crested; wings moderate; the tail short, of 12 weak feathers.

Egypt (ē'jipt), a country in the northeastern part of Africa, governed by a ruler (the *khedive*, or viceroy) who pays tribute to the sultan of Turkey, but is virtually independent. Egypt is bounded on the n. by the Mediterranean Sea, on the e. by Arabia and the Red Sea; and on the w. by the Libyan Desert. Its natural southern frontier may be placed about Assouan (about 500 mi. s. of the Mediterranean), near which cultivated land almost disappears and the country begins to assume the features of the Nubian Desert. Egyptian troops, however, still hold the country as far as the Second Cataract of the Nile at Wady Halfa (about 670 mi. s. of the Mediterranean), which is the limit of free navigation for larger vessels. The authority of the khedive extended till recently over the countries on the Upper Nile up to a few degrees from the equator, including Kordofan, Darfur, Bar-el-Ghasal, etc.; but this territory acquired by conquest and known by the general name of the Soudan, has been evacuated owing to the rebellion of the people against Egyptian authority. On the Red Sea littoral the farthest point s. under the Egyptian flag is Suakin. A small strip of n.w. Arabia on the e. of the Red Sea belongs to Egypt, as also the Sinaitic peninsula and the Isthmus of Suez. Area 394,000 sq. mi.; pop. 6,817,265. The capital and largest town is Cairo, the next largest and chief seaport is Alexandria.

The inhabited portion of Egypt is mainly confined to the valley of the Nile, which, where widest (at the Delta), does not exceed 80 mi., and narrows steadily as we ascend its stream till, at the southern frontier, it is only 2 mi. wide. The Nile has no tides, but runs constantly toward the sea at the rate of 2½ to 3 mi. an hour. After it enters Egypt it flows in a northward direction but with considerable bends till it reaches a little beyond Cairo, where it divides into two main streams, the Rosetta and Damietta branches, which enclose that portion of land known as the Delta and formed by deposits of alluvial matter. Bordering on the Mediterranean are several salt lakes or

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lagoons, Menzaleh being the largest, through which is carried the Suez Canal, connecting the Mediterranean and the Red Sea; and also passing through other salt lakes; about 150 mi. s. of the Mediterranean is the lake Birket-el-Kurun, fed by the Nile. As very little rain falls in Egypt, the prosperity of the country entirely depends upon the Nile, and especially upon the yearly overflow of the river, which so fertilizes the soil with a brown slimy deposit that it produces two crops a year. Beyond the limits of the inundation and of irrigation there is no cultivation whatsoever. The Nile begins to rise in June, and continues to increase until September, overflowing the low lands along its course, the waters being conveyed by canals where natural channels fail. The Delta then looks like an immense marsh interspersed with islands, villages, towns, and plantations, just above the level of the water. After a few days the water begins to subside, and leaves the land again dry about the end of October. The seed is then sown, and artificial irrigation is maintained by water raised from the river, and distributed by means of channels throughout the fields. The appliances for raising water are simple and primitive; chiefly the *shadoof* worked by two men, and the *sakieh* driven by a donkey or an ox. The land is soon covered with green crops, and the first harvest is in March.

At Cairo the valley of the Nile becomes well defined. It is bordered on the east by what are called the Arabian hills, and on the west by the Libyan ranges. Beyond the limits of the valley on the Libyan side are five oases at intervals—those of Khârgeh, Dâkhel, Farâfra, Sîwa, and Bahrîyeh—islands of verdure and cultivation, in some of which artesian wells are numerous. The great oasis Wah-el-Khârgeh extends south for 100 mi. These oases are also dependent on the Nile like the rest of habitable Egypt, for the water to which they owe their existence is partly derived from the subterraneous percolation from that river. The territory to the east of the Nile is mainly a bare rocky region, mountainous toward the coast, maintaining a small nomadic population. The broad plains of the Delta and the comparatively narrow valley of the river higher up, make two natural divisions of Egypt, upper and lower. These were anciently regarded as separate kingdoms. The lower part of the valley, however, which includes the fertile tract adjoining Lake Birket-el-Kurun, known as the Fayoum, differs so much from the higher part as to give rise to the division into Lower, Middle, and Upper Egypt. The country is now divided into governorates and mudiriehs.

The atmosphere in Egypt is extremely clear and dry, the temperature regular and exceedingly hot. The winter months are the most delightful part of the year; later, the ground becomes parched and dry, and in May the suffocating khamseen, or simoom, begins to blow from the desert plains. Rain is scanty except near the seashore; but at night the dews are heavy in Lower Egypt, and the air cool and refreshing. Egypt is not remarkably healthy, as, in addition to visitations of plague and cholera, ophthalmia, diarrhœa, dysentery, and boils are very prevalent.

The rock formations of Egypt consist largely of nummulite limestone, especially at the Nile and in the Libyan Desert, and of granite, syenite, porphyry, and other crystalline rocks in the Arabian Desert (between the Nile and Red Sea), with sandstone in the south. Over a great extent of Egypt the rocks are covered with shifting sands, and in the lands bordering on the Nile by the alluvium deposited during the inundations, and which consists of an argillaceous earth or loam, more or less mixed with sand. Among the useful minerals found in the country are granite, syenite, basalt, porphyry, limestone, alabaster, natron, bitumen, salt, and sulphur.

Now as formerly there is little timber, the principal trees, besides the date palm and tamarisk, being the sycamore fig, and acacia or gum-arabic tree, which last does not attain to any size n. of Wady Halfa. The papyrus plant, once so important, is now to be found only in one or two spots. Of it was manufactured a paper which was supplied to all the ancient world. Besides the lotus or water-lily of the Nile, Egypt has always been celebrated for its production of corn, barley, a great variety of the bean class, leeks, garlic, onions, flax, and for plants of the cucumber tribe. To the products of ancient times have been added the sugar cane, cotton plant, indigo, and tobacco.

Egyptian oxen were celebrated in the ancient world. The camel was early introduced; horses and asses have always abounded; sheep and goats are numerous; the cat is universal as a domestic animal. Wild animals include the hyena, jackal, fox, lynx, genet, ichneumon, jerboa, wild goat, gazelle and one or two other antelopes, hare, etc. The crocodile formerly reached the Delta, but is now seldom seen below Assouan. Water fowl are plentiful; so are vultures and other birds of prey. The sacred ibis is still found in the south, and the pelican in the northern lagoons. Among the countless insects are the sacred beetle, the locust, and mosquito.

In spite of the fact that at least two and sometimes three successive crops may be gathered in a year, agriculture in Egypt is still in a very low state; and the extreme poverty and generally wretched condition of the cultivators render improvement difficult. There are few trades which have attained a development of any importance. The tanning and pottery-making, however, deserve praise; coarse cotton cloths are made; silk is cultivated; and the sugar cane is grown to a considerable extent. The commerce of Egypt is considerable, and has greatly increased since the construction of the Suez Canal and the railways. The railways have a length of about 1,200 mi. The total value of exports amounts to $65,750,000, that of imports to $56,000,000.

Of the inhabitants of Egypt those of the peasant class, or Fellahs as they are called, appear to be descendants of the ancient

Egyptians mixed with Arab blood. Having embraced Mohammedanism, they are often denominated Arabs, though regarded by the true Arab with contempt. The Copts are the descendants of the ancient Egyptians who embraced and still cling to the Christian religion. Though comparatively few in number, their education and useful talents enable them to hold a respectable position in society, as clerks, accountants, etc. With those aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (chiefly Bedouins), Armenians, Berbers, negroes, and a considerable number of Europeans, especially Greeks and Levantines.

The government of Egypt is in the hands of the khedive, or viceroy, who is assisted by a ministry formed on the model of those of Western Europe. The title and government are hereditary, but the khedive, as a Turkish vassal, has to pay an annual tribute to the sultan of $3,500,000. For some years previous to 1882 two controllers general, appointed respectively by France and Britain, had extensive powers of control in the administration of the country; but in that year the French having refused to lend assistance in putting down the rebellion of Arabi Pasha, a British army occupied Egypt, and the government has since been carried on under the supervision of Britain, various reforms having been introduced. Egypt is much burdened by the public debt, which amounts to the sum of $517,278,200.

History.—The Egyptians are the earliest people known to us as a nation. When Abraham entered the Delta from Canaan they had long been enjoying the advantages of a settled government. They had built cities, invented hieroglyphic signs, and improved them into syllabic writing, and almost into an alphabet. They had invented records, and wrote their kings' names and actions on the massive temples which they raised. The arrangement of Egyptian chronology is still a much disputed point among scholars. A list of the kings of Egypt, arranged in 30 dynasties, was given by the priest Manetho (about 250 B. C.), and this division is still used. The Fourth Dynasty is distinguished as the "Pyramid Dynasty." Three of its kings, Khufa, Khafra, and Menkaura (according to Herodotus, *Cheops*, *Chephren*, and *Mykerinos*), built the largest pyramids. The date assigned to these kings in the chronology of Lepsius is 2800–2700. About 2100 Egypt was conquered by the Hyksos, or shepherd kings, who invaded Egypt from the east and established their capital at Tanis (Zoan). The Theban princes seem, however, to have preserved a state of semi-independence, and at last a revolt commenced which ended by the shepherd kings being completely driven out of Egypt by King Aahmes (Amăsis) of Thebes (about 1600), the first of the Eighteenth Dynasty. With Aahmes and the expulsion of the shepherd kings began the reigns of those great Theban kings who built the magnificent temples and palaces at Thebes. The Ramessides form the Nineteenth Dynasty. They commence with Rameses I, who seems to have been of Lower Egyptian extraction. His grandson, the great Rameses II, or Sesostris, was successful against the neighboring Arabs, and covered Egypt with magnificent buildings. Rameses II was probably the Pharaoh who oppressed the Hebrews, and the exodus may have occurred under his successor Meneptah, or Merenptah. Under the later Ramessides the Egyptian Empire began to decay. A new dynasty (Twenty-first) came to the throne with King Hirhor. He attempted to restore Egyptian rule to the East, and conquered and plundered Jerusalem. After his death Egypt was torn by civil wars, and eventually the Ethiopians, under Shabak (Shabako), conquered it. Uahbra (the Greek Apries, the Hophrah of the Bible) and Aahmes II followed. About 532 Cambyses, king of Persia, overran Egypt and made it a Persian province. During the reign of Cambyses the Egyptians suffered much oppression. After the Persian defeat at Marathon the Egyptians rose and recovered their independence for a short time, but were again subdued, and, in spite of two other revolts, Egypt remained a Persian province till Persia itself was conquered by Alexander the Great, B. C. 332.

Egypt now became a Greek state, many Greeks having been already settled in the country, and the Egyptians were treated as an inferior race. Alexandria was founded as the new Greek capital. On Alexander's death his general, Ptolemy, took possession of the throne and became the first of a Greek dynasty that for three hundred years made Egypt one of the chief kingdoms of the world. The Ptolemies were magnificent patrons of letters and arts. Theocritus, Callimachus, Euclid the geometrician, the astronomers Eratosthenes and Aratus, etc., flourished under their rule. But while the Alexandrian Greeks managed to keep down the native Egyptians, they were themselves sinking under the Romans. Ptolemy Auletes went to Rome to ask help against his subjects, and the famous Cleopatra maintained her power only through her personal influence with Julius Cæsar and Mark Antony. On the defeat of Mark Antony by Augustus B. C. 30, Egypt became a province of Rome. It was still a Greek state, and Alexandria was the chief seat of Greek learning and science. On the spread of Christianity the old Egyptian doctrines lost their sway. Now arose in Alexandria the Christian catechetical school which produced Clemens and Origen. The sects of Gnostics united astrology and magic with religion. The school of Alexandrian Platonics produced Plotinus and Proclus. Monasteries were built all over Egypt; Christian monks took the place of the pagan hermits, and the Bible was translated into Coptic.

On the division of the great Roman Empire (A. D. 337), in the time of Theodosius, into the Western and Eastern Empires, Egypt became a province of the latter, and sank deeper and deeper into barbarism and weakness. It was conquered 640 A. D. by the Saracens under Caliph Omar. As a province of the caliphs it was under the govern-

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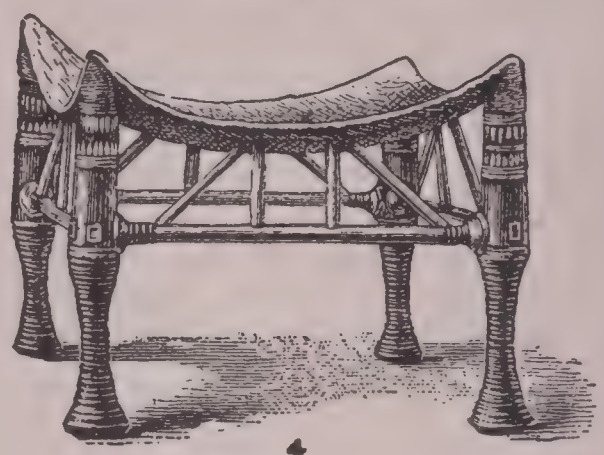

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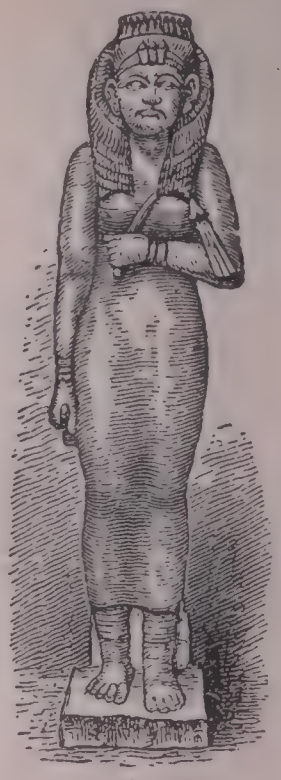

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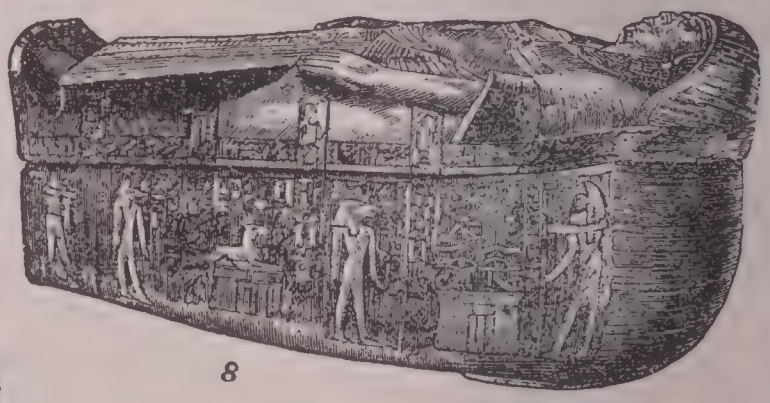

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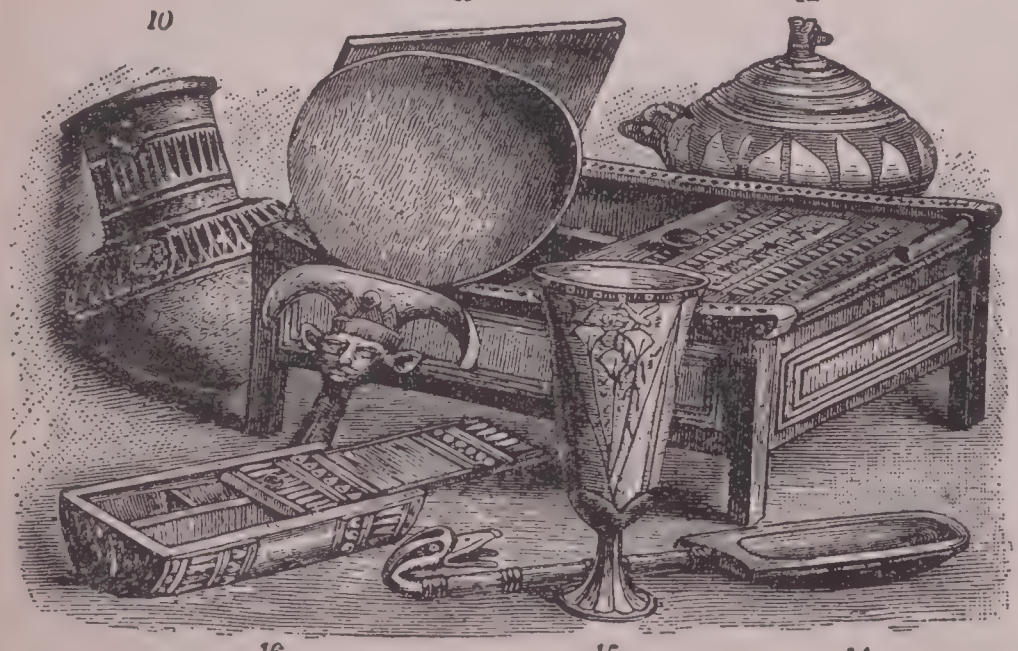

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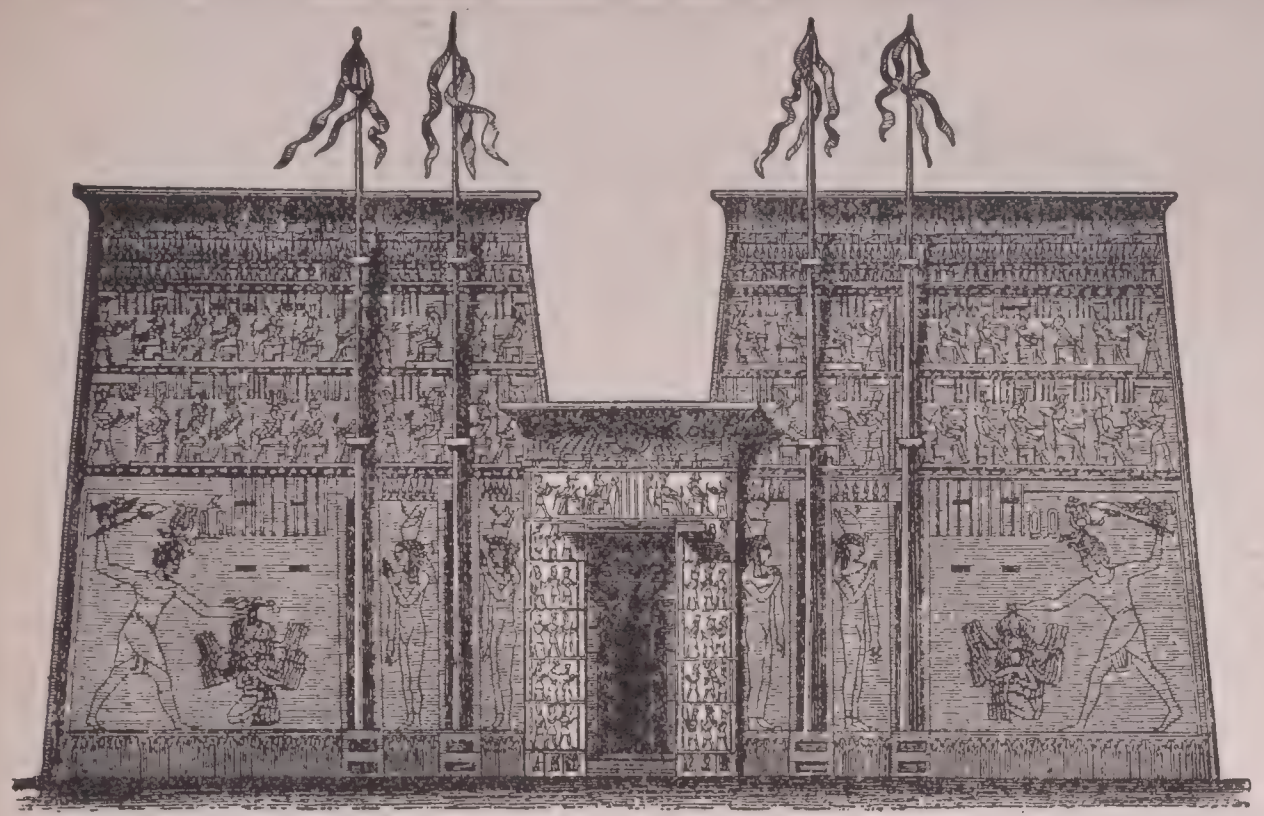
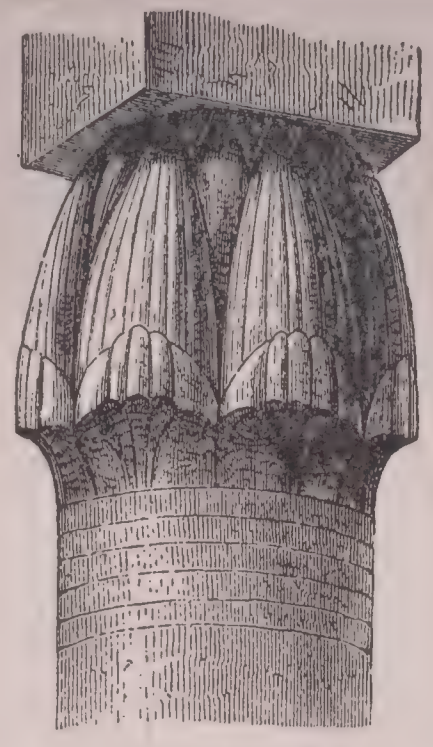
1. Wooden Statute of a Man (about 2600 B. C.) Dagger with Bronze Blade and Ivory Handle. 3. Ivory Carvings. 4. Settee of Ivory and Ebony Wood. 5. Queen Amenerdas (about 720 B. C.) 6. Carved Wooden Spoon with Cover. 7. Sphinx of Rose-granat. 8. Sarcophagur. (XIX. Dynasty). 9. Golden Earrings. 10. Vessel from Fayence. 11 Bronze Mirror. 12. Bowl or Kettle of Cyprian Style. 13. Painted Wood Box. 14. Spoon 15. Cup from Fayence. 16. Carved Wood Box. 17. Family Group (1450—1150 B. C.)



. Front view of Temple at Edfu.



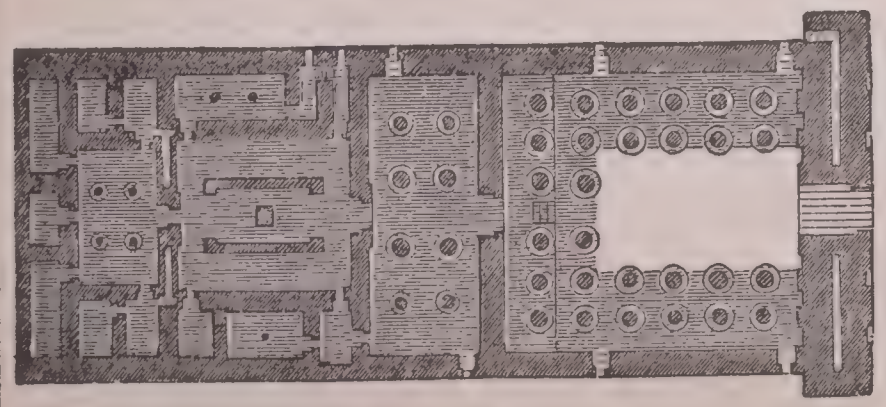
2. Capital at Philæ.

Capital at Dendera,

4. Head of Statue.
(3 to 4 Cent. B. C.)

5. Head of a Statue.
(2200—1900 B. C.)

6. Longitudinal Division of Chonstemple.



7. Grotto Plan of Chonstemple.

8. Grotto Temple of Ramses II. at Abu Simbel.

9. Sitting Figure of a Man
(2200—1900 B. C.)

ment of the celebrated Abbasides—Harun-al-Rashid and Al-Mamun—and that of the heroic Sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1250); and the Mamelukes in their turn were conquered by the Turks (1516–17). The Mamelukes made repeated attempts to cast off the Turkish yoke, and had virtually done so by the end of last century, when the French conquered Egypt and held it till 1801, when they were driven out by the British under Abercromby and Hutchinson.

On the expulsion of the French a Turkish force under Mehemet All Bey took possession of the country. Mehemet Ali was made pasha, and being a man of great ability administered the country vigorously and greatly extended the Egyptian territories. At length he broke with the Porte, and after gaining a decisive victory over the Ottoman troops in Syria in 1839, he was acknowledged by the sultan as viceroy of Egypt, with the right of succession in his family. Mehemet Ali d. in 1849, having survived his son Ibrahim, who d. in 1848. He was succeeded by his grandson Abbas, who, dying in 1854, was succeeded by his uncle Said, son of Mehemet. Under his rule railways were opened, and the cutting of the Suez Canal commenced. After Said's death Ismail Pasha, a grandson of Mehemet Ali, obtained the government in 1863. His administration was vigorous but exceedingly extravagant, and brought the finances of the country into disorder. In 1866 he obtained a firman from the sultan granting him the title of khedive. In 1879 he was forced to abdicate under pressure of the British and French governments, and was replaced by his son Tewfik. In 1882 the "national party" under Arabi Pasha revolted and forced the khedive to flee. On July 11 a British fleet bombarded Alexandria and restored the khedive, and at Tel-el-Kebir Arabi's forces were totally crushed on September 13. A rebellion in the Soudan under the leadership of Mohammed Ahmed, the so-called mahdi, now gave the government trouble. In 1883 the mahdi's forces annihilated an Egyptian force under Hicks Pasha in Kordofan. British troops were now despatched to Suakin and inflicted two severe defeats on the mahdi's followers there. But the British cabinet had resolved to abandon the Soudan; and General Gordon, already famous for his work in this district, was sent to effect the safe withdrawal of the garrisons (1884). By this time, however, the mahdi's forces were strong enough to shut the general up in Khartoum. For nearly a year he held the town, but perished (January, 1885) before the relief expedition under Sir Garnet Wolseley could reach him.

The expedition withdrew, and the Sudan was left in a state of anarchy. In the equatorial region one of General Gordon's lieutenants-known as Emin Pasha, still held out, and in 1888 he was visited by the explorer Stanley at the head of a relief expedition. British interference here stopped the rebel advances and held Wady Halfa as an advance post of Egyptian territory. The Mahdi again threatened

Egypt in 1896, and the British government again took steps to crush him. The European powers began to fret over the question of the war in Egypt, but Great Britain persisted in military operations.

General Sir H. H. Kitchener was made commander-in-chief, or Sidar, of the Egyptian army by the Khedive. The army consisted of 12,000 men, all native Egyptian troops, except 1,200 British regulars. The troops began to move toward the southern frontier in March, and in less than a month reached Assouan. The Dervishes attacked the Egyptian troops on several occasions, but were repulsed. In September, 1896, an advance was made upon Dongola, and the principal Dervish chiefs surrendered. The Anglo-Egyptian forces on the Nile continued to push their way southward, and by the end of October established their position as far as the mouth of the Atbara river. They made an effective reconnoisance by gunboats up to and through the town of Metammeh, where the Dervish forces were strongly entrenched.

The leisurely but effective advances of the Anglo-Egyptian expedition moving up the Nile caused considerable comment in Great Britain. The people became restless for more aggressive news from that quarter, but General Kitchener seems to have been complete master of the situation. He planned his campaign on modern lines, using the most modern machinery, proceeding a stage at a time, and pausing until his corps of railroad builders had brought their construction clear up to his camp. Besides, on the Nile he had a number of gunboats of very light draft, all armed with Maxim and other rapid-fire machine-guns. He took the precaution to protect the rear and keep the railroad open, thus preventing the enemy from cutting in behind. The Dervishes crossed the Nile to Shendy, and advanced up the river as if to meet the Sidar at Berber. They selected their ground at Dakhila, where the Atbara river joins the Nile. Meanwhile the British gunboats had passed forward and captured Shendy, and the Dervishes, to the number of about 20,000, were cut off from their supplies.

The Anglo-Egyptian army advanced promptly to meet them in their entrenched position. The fight occurred April 8, 1898. The Mahdi's forces were totally routed, leaving about 5,000 dead upon the field. The combined British and Egyptian troops sacrificed about 60 men killed and 300 to 400 wounded. The use of the Maxim guns was responsible for the great slaughter of the Dervishes. The Caliph's troops were led in the fight of April 8 by Emir Mahmoud, who was captured.

Omdurman is the new capital of the Sudan, built by the Mahdi after his seizure and destruction of Khartum in 1885. As General Kitchener's expedition approached Omdurman the Caliph's army gradually but bravely came forth to meet the enemy. The result of his defeat has been the reopening of the great region which the fanatical movement of the '80's, led by the Mahdi, closed up. At that time the region was occupied by not less than

12,000,000 people. Under the rule of the Mahdi the district became desolate, trade was destroyed, and the population was reduced about one-half.

As soon as General Kitchener had firmly established himself at Khartum he received a definite report from a Dervish force returning from an expedition up the Nile, that they had encountered a body of white men who carried a tri-colored flag. The Sirdar promptly steamed up the river with a body of troops and three gunboats to investigate. He reached Fashoda, and found there Major Marchand, with a half dozen other Frenchmen and a body of Senegalese soldiers.

General Kitchener informed Major Marchand that he was on Anglo-Egyptian territory, and requested him to lower his French flag. He said that he was acting under the authority of the French government and could not obey the Sirdar without authority from the French government. The camp occupied by the French was located on a tongue of land surrounded by impassable morasses, except for a narrow entrance. Here General Kitchener established a sufficiently strong force of Egyptian troops and proceeded farther up the river, and established another outpost of Egyptian troops.

This expedition immediately gave cause for alarm in Great Britain, but after some diplomatic correspondence the French government explained that Major Marchand was simply making an exploit of African travel, and they hastened to disclaim any intention whatever of occupying the territory.

The convention between the British and Egyptian governments, signed at Cairo, January 19, 1899, provides for the administration of the territory south of the twenty-second parallel of latitude by a governor-general appointed by Egypt with the assent of Great Britain, and declares the general principles in accordance with which the administration shall be carried on. The British and Egyptian flags shall be used together; laws shall be made by proclamation; no duties shall be levied on imports from Egypt, and duties on imports from other countries shall not exceed those levied in Egypt. The Sudan has been divided into four first-class districts, Omdurman, Senaar, Kassala, and Fashoda; and into three second-class districts, Assuan, Wady Halfa and Suakim. Extending southward from the frontier of Egypt and Lake Albert Nyanza, a distance of about 1,400 miles, and stretching from the Red Sea to the confines of Waday in Central Africa, is an immense district which is divided into the provinces of Dongola, Khartum, Suakim, Kordofan Dar Foor, and the Equatorial province. Became gov.-gen. in Jan., 1899, but was transferred later to South Africa.

Ancient Civilization.—The civilization of the Egyptians had reached a high pitch from the earliest period to which we can trace their history. The masonry of the passages in the great pyramid has not been surpassed at any age. In mechanical arts the carpenter, boat-builder, potter, leather-cutter, glass-blower, and others are frequently represented on their ancient monuments, and we see the blow pipe, bellows, and siphons; the press, balance, lever; the saw, the adze, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III, 1445 B. C. Gold beating, damascening, engraving, casting, inlaying, wire drawing, and other processes, were practised. The processes of growing and preparing flax, as well as the looms employed, are all depicted. The social and domestic life of the ancient Egyptians is pictured for us on the walls of their temples and tombs. The rich spent much of their time in hospitality and entertainments, especially of a musical kind. In the country districts the superintendence of the agricultural works or the fisheries on their estates was varied by the sports and pleasures of a country life. The lower orders were poor and uneducated, scantily fed and clothed, and held in contempt by the higher classes. But there was no strict separation into caste; and although the priests formed a ruling bureaucracy, the highest posts were open to the successful scholar. Next to the priesthood in importance was the military class or order, who were all landholders and bound to serve in time of war. Below these were the husbandmen, who paid a small rent to the king. Egyptian custom seems to have allowed but one wife, who occupied an honorable and well-established position as the "lady of the house."

The two main principles on which the religion of Egypt was based appear to have been the existence of an omnipotent Being, whose various attributes being defined, formed a series of divinities; and the deification of the sun and moon. Each group of divinities formed a triad composed of a chief male deity, with a wife or sister and a son, as Osiris, Isis, and Horus, or Amun, Maut, and Khonso. Among the other gods of the Egyptian Pantheon are Ra, the sun, usually represented as a hawk-headed man. Mentu and Atmu are merely two phases of Ra, the rising and the setting sun. The worship of the bull Apis is connected with Osiris. Serapis is the defunct Apis, who has become Osiris. Seth, or Set, represents the power of evil. Ammon (Egyptian Amen), originally a local god, owed his importance to the greatness of his city, Thebes. Thoth is the chief moon-god, and is generally represented as ibis-headed. Anubis, the jackal-headed, belonged to the family of Osiris, and presided over mumification. Besides these deities the Egyptians worshiped beasts, reptiles, and even vegetables, probably as symbols. The Egyptians believed in the transmigration of souls, and in the existence of a future state, in which mankind would be rewarded or punished according to their actions while on earth.

Ancient Architecture and Sculptures. — The monuments of Egypt are of two main periods —those built in the times of the Pharaohs, or

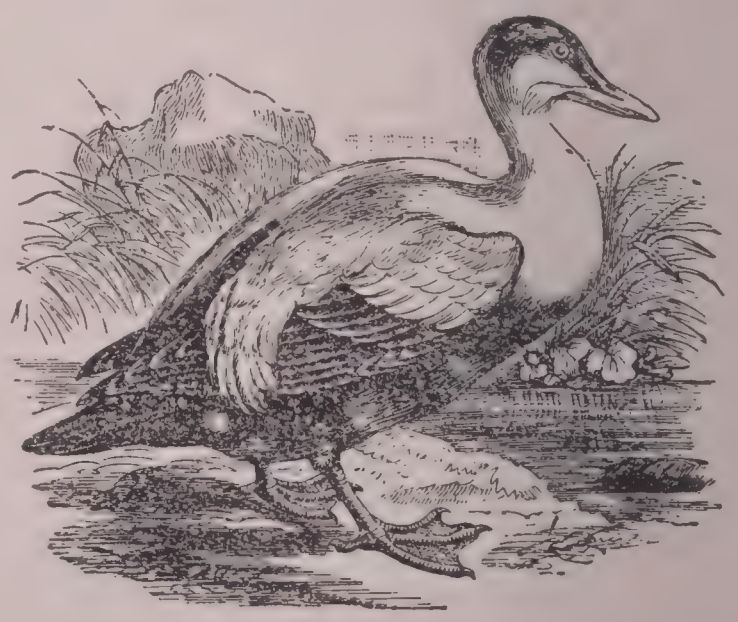
native kings, and those built during the rule of the Greeks and Romans (subsequently to 330 B.C). The former period was by far the longer and more important, and to it belong the most characteristic examples of Egyptian architecture, such as pyramids, vast temples, some of them cut in the solid rock (as at Ipsambul), rock-cut tombs, gigantic monolithic obelisks, and colossal statues. The characteristic features of the style are solidity, boldness, and originality. Among its peculiar characteristics may be noted: symmetry of structure; the gradual converging of the walls of some of its edifices, especially of the propylæa or tower gateways of its temples; roofs and covered ways being flat, and composed of immense blocks of stone reaching from one wall or column to another, the arch not being employed nor yet timber; columns numerous, close, and massive, generally without bases, and exhibiting great variety in their capitals, from a simple square block to an elaborate composition of palm leaves or other forms suggested by vegetation; the employment of a large concave molding in the entablature, decorated with vertical flutings or leaves; walls and columns decorated with a profusion of sculptures in outline or low-relief, representing divinities, men, and animals, with innumerable hieroglyphics, brilliant coloring being often superadded. The pyramid is one of the best known forms of Egyptian art, and there is little doubt that these structures were intended as the tombs of kings. The leading features of the Egyptian temples were these: a gateway flanked by two lofty *pylons* formed the entrance to a square court. From this court the way leads through a second gateway to an inner court surrounded by a colonnade. Beyond this is the chamber of the temple known as the Hall of Columns, the center avenue of which was higher than the rest of the hall, and consisted usually of twelve columns, which supported a flat roof formed of massive stones, light being admitted at the sides of this elevated portion. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns. These apartments frequently surrounded a dark chamber —the most sacred in the temple—the holy of holies. The surface of each architectural feature was engraved with its particular ornament appropriately colored. In the *cavetto*, or hollow molding of the cornice, it was customary to place the name and titles of the Pharaoh or king; the architrave stone was symbolically ornamented with the names of the divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abacus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus was shown, the leaves of the calyx would be yellow and the filaments green. Beneath were horizontal bands of blue and white, and then a representation of the king offering gifts to the gods of the temple; and, lastly, the yellow and red lines at the base of the shaft signified the brown leaves that envelop the base of the stalk of the natural plant. The Egyptian temple was invariably rectangular, with its walls inclining inward, and never more than one story high, and the approach to it was frequently through an avenue of sphinxes. The temples built during the sway of the Greeks and Romans, though having a general resemblance to the earlier ones, differed in some respects, as in the use of more elaborate capitals, more salient forms in the architectural and sculptural decorations, etc. A peculiar kind of mural sculpture was practised among the Egyptians, the outline of the object to be represented being cut into the surface, while the minor forms and rotundity are shown within this incised outline, thus forming a kind of "hollow relief."

Egyptol′ogy, the science of Egyptian antiquities, or that branch of knowledge which deals with the language, history, etc., of ancient Egypt.

Ehrenbreitstein (ā′ren-brīt-stīn), a Prussian fortress of great strength situated opposite the confluence of the Moselle with the Rhine, on a precipitous rock 387 ft. above the river, and inaccessible on three sides. The fortifications, which were erected in 1816–26 at a cost of $6,000,000, can accommodate a garrison of 14,000 men, and possess room for stores to last an army of 60,000 for a year.

Eider (ī-dėr), a river of Prussia, rises in Holstein, and forms the boundary between Schleswig and Holstein, falling into the North Sea at Tönning after a course of 92 mi.

Eider Duck, a species of duck found both in America and Europe. Its favorite haunts are solitary rocky shores and islands. The eider duck is about twice the size of the common duck. The male is black, head and back white, with a black crown. The female



Eider Duck.

is reddish drab spotted with black, and with two white bands on the wings. They feed largely on shellfish, crustaceans, etc. Their nests are usually formed of drift grass, dry seaweed, etc., lined with a large quantity of down, which the female plucks from her own breast. In this soft bed she lays five eggs, which she covers over with a layer of down.

If this, with the eggs, is removed the bird repeats the process. One female generally furnishes about ½ lb. of down, but the quantity is reduced by cleaning. This down, from its superior warmth, lightness, and elasticity, is in great demand for beds and coverlets; and the districts in Norway and Iceland where these birds abound are guarded with the greatest vigilance as a most valuable property. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 lbs. It is so fine and elastic that 5 lbs. of the best quality is sufficient for a whole bed. The down from dead birds is little esteemed, having lost its elasticity. The king eider duck is another species resembling the preceding and inhabiting the same coasts.

Eiffel, GUSTAVE, engineer, b. in 1832 at Dijon, France. He first attracted attention by the construction of a bridge, in which was employed for the first time, the compressed air method of sinking foundation cylinders. This was followed by many other works of great engineering skill. The most important among these and the one which has made his name famous throughout the civilized world is the Eiffel Tower of the Paris Exposition of 1889. This tower is 984 ft. high, and at the elevation of 896 ft. it is 33 ft. in diameter. The weight of iron used in construction is 7,300 tons. On the top is an immense lantern to which a system of elevators run. Mr. Eiffel was made an officer of the Legion of Honor in recognition of his genius. He was, however, connected with the Panama scandal of 1893, and was convicted of misappropriating funds of the canal company. For this he was sentenced to fine and imprisonment.

Eisleben (īs′lā-bėn), a town, Prussian Saxony, 25 mi. n.w. of Merseburg, celebrated as the place where Luther was born and where he died. There are many memorials of Luther, and also a bronze statue of the reformer erected in 1883. Copper is extensively worked in the neighborhood. Pop. 23,175.

Eject′ment, in law, an action wherein the title to lands and tenements may be tried and the possession recovered. It is commenced by a writ addressed to the tenant in possession and all entitled to defend the possession, bearing that the plaintiff lays claim to the property in question, and calling upon all interested to appear within a certain time to defend their right, failing which the tenant in possession will be ejected. In its older form the action was remarkable for certain curious legal fictions on which procedure was based.

Ekat′erinburg, a town, Russia, in the government and 170 mi. s.e. of Perm, founded in 1723 by Peter the Great. It is the center of the mining and metallurgy of the Ural region; and gem-cutting, making of machinery, cloth, candles, etc., are industries. Pop. 36,750.

Ela′in, the oily principle of fat obtained by submitting fat to the action of boiling alcohol, allowing the stearin to crystallize, and then evaporating the alcoholic solution. It possesses much the appearance and properties of vegetable oil, and forms soaps with alkalies.

E′lam, the ancient name of a country or region in Asia, east of the Lower Tigris. A king of Elam is said in the cuneiform inscriptions to have conquered Babylonia and Assyria about 2300 B. C. It was latterly incorporated in the Persian Empire.

E′land, a species of antelope inhabiting Africa, the largest of all the antelopes, being about the size of an ox. Its flesh, especially that of the thighs, which are dried and used

Eland.

in this state, is highly prized, and consequently the animal is nearly exterminated in the neighborhood of Cape Colony, where it was once common. The color is a light or grayish brown, and it possesses a short mane. The horns, which are about 18 in. long and nearly straight, are spirally keeled.

Elastic′ity is the property in virtue of which bodies resist change of volume and change of shape, and recover their former figure or state after external pressure, tension, or distortion. The former is called elasticity of volume, the latter elasticity of shape. The name *Compressibility* is also used in connection with the elasticity of volume; and *Rigidity*, or resistance to change of shape, in connection with the latter. Fluids possess no rigidity whatever; they offer no *permanent* resistance to change of shape; while a solid body, unless it is distorted beyond certain limits, called the *limits of elasticity*, tends to return to its original form. Both fluids and solids possess elasticity of volume, and tend to resume their original volume after compression. The elasticity of volume of the former is perfect; whatever compression they have been subjected to, they return under the same conditions of temperature to precisely their original volumes when the forces of compression are removed. In the case of solids there are limits to their elasticity of volume as well as to their elasticity of form; thus gold may be made permanently denser by hammering. There is one law of elasticity, the celebrated law of Hooke: *Strain is proportional to stress;* or, in other words, whatever be the nature of the distortion the amount of it is proportional to the stress that produces it. This law is only considered as applicable so long as we do not go beyond the limits of elasticity.

El'ater, the name of a family of beetles, remarkable for their ability to throw themselves to a considerable height in the air, when placed on their back, by a vigorous muscular movement. Hence their names of springing-beetles, click-beetles, skipjacks, etc. When alarmed, the elater counterfeits death. Flowers, grass, and decaying wood are the habitations of these animals, which are almost always found singly. The larvæ are often very injurious to vegetation, especially those which devour the roots of herbaceous plants, and are known from their slenderness and hardness as wire worms. The fireflies of America belong to the family. They possess luminous properties, which are unlike those of the glow worm, etc., being seated near the head.

Elba, a small island in the Mediterranean, in the province of Livorno (Leghorn), Italy, separated from the mainland by the Strait of Piombino, about 6 mi. wide. This island is 18 mi. long and from 2½ to 10½ mi. broad, and is traversed by mountains rising to a height of over 3,000 ft. It is rich in iron, marble, granite, salt, etc., and iron ore is exported. Excellent wine and fruits are produced. It has two seaports, Porto-Ferrajo (the capital) and Porto-Longone. The Treaty of Paris in 1814 erected Elba into a sovereignty for Napoleon, who resided in it from May 4, 1814, to Feb. 26, 1815. Pop. 24,000.

Elbe (elb), a river of Germany, one of the largest in Europe. It rises on the s.w. slopes of the Schneekoppe (or Snowcap), one of the Riesengebirge, between Bohemia and Silesia. The length, including windings, is upward of 780 mi. It is more or less navigable for about 470 mi., but its estuary at Cuxhaven is much encumbered with sand banks. It is well stocked with fish. On July 1, 1870, the navigation of the Elbe was declared free from Hamburg to Melnik in Bohemia.

Elberfeld (el'bėr-felt), a town of Rhenish Prussia, 15 mi. e. of Düsseldorf. It has no historical or antiquarian importance, its prosperity, which is of recent date, being largely due to the cotton manufacture. Linen, woolen, silk, and mixed silk goods, ribbons, and velvet are extensively made and exported. There are numerous mills for spinning cotton twist, linen yarn, and worsted, and numerous dye-works, and miscellaneous industrial establishments. Pop. 242,078.

Elbeuf (el-beuf), a town of France, dep. Seine-Inférieure, 11 mi. s.s.w. of Rouen, in a valley on the left bank of the Seine. It is well built, and has eight artesian wells. It has spinning mills, dye works, and is an important center for the production of woolen manufactures, chiefly of lighter cloths and fancy goods. It is also an entrepôt for the finer and heavier cloths of Louviers and Sedan. It communicates by steamers with Paris, Rouen, and Havre. Pop. 21,173.

Elbing, a seaport town of West Prussia, on the Elbing, near its entrance into the Frische-Haff. It was once a flourishing Hanse town, and is still a place of considerable industry and trade, the manufactures including iron goods, machinery, brass and tinplate goods. It has also ship building yards. Pop. 38,278.

Elburz, a lofty mountain range extending over Northern Persia, parallel with and overlooking the Caspian. Highest peak, Mt. Demavend, 19,400 ft.; average height, 6,000 to 8,000 ft.

Elder, a name given to different species of the genus *Sambucus*, nat. order Caprifoliaceæ. These are small trees or shrubs, with opposite and pinnated leaves, bearing small, white flowers in large and conspicuous corymbs, small berries of a black or red color, and bitter and nauseous leaves possessing purgative and emetic properties. The wood of the young shoots contains a very large proportion of pith. The common elder of Britain is a wild shrub or small tree, distinguishable by its winged leaves; its clusters of small, cream-white flowers, and the small black berries by which these are succeeded, and from which a kind of wine is sometimes made. The dwarf elder or danewort is also found in many parts of Britain, and was vulgarly supposed to have sprung from the blood of the Danes. Two species inhabit North America, *S. canadensis*, a common plant from the 49th to the 30th parallel of latitude, the berries of which are black and have a sweet taste; and *S. pubescens*, which bears red berries, and inhabits Canada, the northern parts of New England, and the Alleghany Mountains. Elder wood is yellow, and in old trees becomes so hard that it is often substistituted for boxwood. Its toughness also is

Flowering Branch of Common Elder.
a.—flower; *b.*—berries.

such that it is made into skewers, tops for fishing rods, etc. The light pith is utilized for balls for electric experiments, and various ointments, drinks, and medicinal decoctions are made from the bark, leaves, flowers, and berries.

El Dora'do, a country that Orellana, the lieutenant of Pizarro, pretended he had discovered in South America, between the Ori-

noco and Amazon rivers; and which he named thus on account of the immense quantities of gold and precious metals which, he asserted, he had seen in Manoa, the capital of the country.

Eleat'ic School, a Grecian philosophical sect, so called because it originated in Elea, a town of Magna Græcia (Southern Italy), of which also three of its most celebrated teachers, Parmenides, Zeno, and Leucippus, were natives. The founder was Xenophanes of Colophon, who came to Elea late in life, bringing with him the physical theories of the Ionian school, to which he added a metaphysic. The two schools soon drifted widely apart especially in respect of method. Starting from the observation of external nature, the Ionians endeavored to discover some elementary principle, as water, air, fire, or a combination of elements, by the action of which the phenomena they observed might be accounted for. The Eleans made the abstract idea of Being, or God, deduced from the contemplation of the universe as a whole, their starting point; and their reasonings sometimes led them to deny the reality of external phenomena altogether.

Elecampane (el-i-kam-pān'), a plant of the natural order Compositæ, found in the U. S. and Europe, and in Asia. It is 3 or 4 ft. high; the radical leaves are often 2 ft. and more in length; the flowers are large and yellow; the

Elecampane; *a*.—flower.

root, which is perennial, possesses a bitter camphor-like taste. It was formerly much used as a stimulant for all the secreting organs.

Electoral College in the U. S. is a body of men who are chosen by the people of the several states to elect the president and vice-president. The number of electors chosen by each state is equal to the whole number of members that each state sends to both houses of Congress. No senator or representative or person holding an office of profit or trust under the U. S. can be chosen as an elector. The

day on which electors are chosen must be the same in all states—the Tuesday next after the first Monday in November. It is ordained by the Constitution that the electors shall meet in their respective states on the first Wednesday in December and vote by ballot for president and vice-president, one of whom, at least, shall not be an inhabitant of the same state with themselves, and they shall make distinct lists of all persons voted for as president, etc., and of the number of votes for each; which lists they shall sign and certify and transmit, sealed, to the seat of government of the U. S., directed to the president of the Senate. A majority of the whole number of electoral votes is necessary to elect. If no candidate has a majority of votes, the House of Representatives must choose either of the three persons having the highest number of votes. On the second Wednesday of February of the year following the election the electoral votes are opened and counted by both Houses of Congress, which meet in the hall of the Representatives. The electors do not use discretionary powers but cast their votes for the candidates previously nominated by their respective parties.

Election, in politics, the selection by voting of a person or persons to occupy some post or office. The most important elections are those of the members of the legislative assemblies of the different countries, and as to the manner in which these are carried out strict laws are in force. In such elections voting by ballot is now general. Jurisdiction of election laws of the U. S. extends to such officers of federal government as are elective, viz., the president, vice-president, and members of the House of Representatives. The election of officers of the state governments is regulated by the several state codes. The president and vice-president are elected by a college of electors, which college is composed of as many electors as there shall be senators and representatives in Congress at the time of the appointment of such electors. The people vote directly for these electors. Members of Congress are elected as follows: Each state is entitled to two senators in Congress, who are elected by the legislatures of the several states; members of the House of Representatives are elected directly by the people. All citizens of the U. S. are entitled to vote except citizens of the District of Columbia. In 1870 persons of African descent were given the right to participate in elections. The states of the Union from time to time enact laws for the regulation and management of their local elections, embracing the choice of the officers of the state, city, and county. The constitutions of the several states secure to citizens the right of suffrage. The laws of each state provide the means of effecting the ends of the constitution, and prescribe the qualifications of voters, which vary somewhat in the different states. In all the states the following qualifications may be classed as universal: That the elector shall be over twenty-one years of age, neither lunatic nor a pauper, and prepared to take, if necessary, an oath of allegiance to the federal

government. The length of residence in the state previous to an election is fixed by the state law and varies in the different states. Property qualification is required only in Rhode Island. Some of the states require an ability to read and write. In the state of Wyoming the right of suffrage is extended to women, with power to hold office.

Electrical Fishes, a name given to fishes possessing the property of communicating an electric shock when touched with the hand or any electric conductor. One of the best known is the electric eel, a native of South America. It is of nearly equal thickness throughout; head and tail obtuse; ordinary length 3½ to 4 ft. The seat of the four electrical organs is along the under side of the tail, and they are said to possess the power of knocking down a man, and of painfully numbing the affected limb for several hours after the shock. After a few discharges, however, the faculty of producing a shock is impaired, and an interval of rest is required for a new storage of force.

Electric Battery, the original name of what is now more commonly called a battery of Leyden jars, the old name having been given before galvanic batteries were invented. See *Galvanic Battery.*

Electric clock, a clock driven or controlled by electricity, the latter being the ordinary meaning of the term. One clock driven in the ordinary way can be made to control by electric currents another clock (or clocks) also driven in the ordinary way so as to make it keep accurate time. The method of R. L. Jones, more or less modified, is now in very extensive use. By means of it one high-class clock compels a number of other clocks at considerable distances to keep time with it. The clocks thus controlled ought to be so regulated that if left to themselves they would always gain a little, but not more than a few minutes per day. The pendulum of the controlling clock, in swinging to either side, makes a brief contact, which completes the circuit of a galvanic battery, and thus sends a current to the controlled clock. The currents pass through a coil in the bob of the pendulum of the controlled clock, and the action between these currents and a pair of fixed magnets urges the pendulum to one side and to the other alternately. The effect is that, though the controlled clock may permanently continue to be a fraction of a second in advance of the controlling clock, it can never be so much as half a second in advance. An electrically controlled clock usually has close beside it a small magnetic needle, which moves to the one side or the other according to the direction of the current, and thus shows whether the currents are coming. The arrangements are usually such that at every sixtieth second (that is, at every exact minute) no current is sent, and the needle stands still. Any small error is thus at once detected.

Electric Dynamo. The commercial electrical generator is called a dynamo. It consists of an armature, which is made to revolve at a high speed, by means of a steam engine,

water wheel, or other prime mover, in the field of a powerful electro-magnet. The practical principle at the base of all dynamos is the fact, that every motion of conductor past a magnet, or of a magnet past a conductor, induces electricity. The revolving part of a dynamo, called the *armature,* is made up of copper wires or bars wound upon an iron core, which may be either a ring, drum, or disc. The field magnets of the dynamo are placed in relation to the armature so that it revolves in the magnetic field, cutting the lines of force. The copper bars are insulated from the core and from each other by mica or paper, and are so wound around the core that one part of the copper is entering the field, thus increasing its "potential," while the other is leaving the field and decreasing it, producing a flow from positive to negative. The current is collected, or brought to one conductor, by means of the *commutator* of the dynamo, and is led to the conductor through brushes of copper or carbon.

If the magnetic field is strong, and there are many turns of wire on the armature so that each wire cuts many lines of force in a given time, a current of high tension is secured. If the magnetic field is weak, and the armature has but few turns of wire, the current is low tension. In some dynamos, the armature revolves in the field, and in others the field magnets revolve around the armature. Dynamos are continuous when the current is direct or flows one way all the time, and alternating when the current rapidly and constantly changes from positive to negative.

Tesla's oscillator works on the reciprocating principle. That is, the armatures are on each end of a shaft which project beyond a steam box, in which a pair of pistons, actuated by steam, drive the shaft, shuttle fashion, back and forth at an extremely rapid rate. The armatures shoot back and forth in the magnetic field of a powerful electro-magnet, and the result is a current of tremendous strength, high voltage, and great frequency.

Electric Heating. When a conductor is large enough it carries the electrical current without heating, but when the wire or conductor has not enough capacity for the current the resistance gives rise to heat. Electricians have taken advantage of this fact to use electricity for heating, cooking, and welding. The wire is imbedded in an enamel which has about the expansive degree of the conductor. The current, meeting resistance, heats the wire. If there was no substance present to convey off this heat the wire would fuse or weld, but the enamel carries off the heat generated, and the current continues to pass along the wire. In practise, the enamel plates, with the wire buried in them, are placed in ovens, on the bottoms of kettles, pans, and other kitchen utensils, in broilers, gridirons, and on the polishing surface of flatirons. By this means frying, boiling, baking, broiling, and stewing are performed by the heat produced by electricity. Welding iron and steel and other metals susceptible of being united un-

der high temperatures and pressure, is done by pressing together the surfaces to be welded, and then passing through them a current of high voltage. In practise, the parts to be welded are clamped together, and more pressure is applied when the metal, at the point of weld, is brought to a welding heat. One particular advantage found in welding by electricity is that the surfaces do not oxidize, consequently, there is no necessity for using a flux.

Electric′ity, the name given to the unknown cause of certain effects of various kinds which are found to be closely connected one with another. They include two distinct kinds of attraction and repulsion (*electrostatic* and *electrodynamic*), the magnetization of iron, the deflection of magnetic needles, the production of heat and light in certain circumstances, the separation of certain chemical compounds into their constituents, and spasmodic actions on the nervous and muscular systems of animals. The name is derived from the Greek *ēlectron* (amber), the fact that amber when rubbed attracts light particles, such as small pieces of paper, having been known to the ancient Greeks. Friction was the only artificial source of electricity employed until Galvani, near the close of last century, accidentally obtained it by the contact of two metals with the limbs of a frog; and Volta, developing Galvani's discovery, invented the first galvanic or voltaic battery. Electricity produced by friction is called *frictional electricity;* that produced by chemical action on metals, *voltaic electricity.*

Conductors and Nonconductors. — All substances which, like amber, could be made to show electrical attraction by rubbing them, were called *electrics* by early writers on electricity. They included glass, amber, sulphur, shellac, rosin, silk, flannel, etc. The name *nonelectrics* was given to other bodies which were supposed not to be susceptible of excitation by friction. The bodies called nonelectrics were also called *conductors*, from the power which they exhibited of allowing electricity to pass through them. Electrics were also called *nonconductors.* The names conductor and non-conductor are still retained, but the names electric and nonelectric are discarded as being founded on a mistake. Electricity can be excited by the friction of a conductor against a non-conductor, and is, in fact, so excited in the ordinary electrical machine, in which glass rubs against an amalgam spread on a cushion. A metallic rod furnished with a glass handle can be electrified by rubbing it with flannel, the glass preventing the electricity from being conducted away through the hand. Substances thus electrified exhibit two opposite kinds of electricity, known respectively as *positive* and *negative.* Bodies charged with the same kind of electricity repel each other; those charged with opposite kinds attract each other. An instrument for indicating the presence of electricity is called an *electroscope.*

Electric Conduction.—All solid and liquid substances allow electricity to pass through them to some extent, but the differences of degree are enormous. The best conductors are the metals, especially gold, silver, and copper. Perfectly pure copper conducts about seven times as well as iron. Substances which have excessively small conductive power are not called conductors, but *insulators*, so that a good insulator is another name for an excessively bad conductor. Among the best insulators may be mentioned glass, paraffin (the wax, not the oil), ebonite, shellac, mica, india rubber, and gutta percha. The ratio of the conducting power of a metal to that of one of these substances is about a thousand million billions to one. Water occupies an intermediate position between these two extremes. In experiments with frictional or influence machines it behaves as a conductor, but in experiments with galvanic batteries it behaves as an insulator. The word *resistance* is used in the opposite sense to conducting power; a good insulator is said to have high resistance, and a good conductor to have low resistance.

Electrostatics is that branch of the general science of electricity which treats of the repulsions between like and the attractions between unlike kinds of electricity, The fundamental law of electrostatics is, that if *e* and *é* denote two quantities of electricity collected in two spaces very small in comparison with the distance between them, the mutual force which they exert upon each other is directly as the product *eé*, and inversely as the square of the distance. If the two quantities *eé* are both positive, or both negative, the force is a repulsion, but if one is positive and the other negative, it is an attraction. Electrostatic attractions and repulsions manifest themselves in two distinct ways; namely, 1, as attractions and repulsions between electrified bodies; 2, as producing changes in the distribution of electricity on conductors. This second effect is called *electrostatic induction.* The different portions of the charge of one and the same conductor act upon one another according to the general law of repulsion, and thus produce the actual distribution, which is entirely on the surface, all electricity being repelled from the interior. The interposition of an insulating substance between two quantities of electricity alters the amount of the forces which they exert upon each other. In a broad sense electrostatics may be held to include within its range all the phenomena of frictional electricity and of the electricity produced by influence machines, such as those of Holtz, Voss, and Wimshurst. See *Electric Machine.*

Electric Discharge.—The rapid escape of electricity from a charged body is an electric discharge. When the discharge takes place through a conductor it is called *continuous*, and when it takes place through a nonconductor (for example through air) it is called a *disruptive discharge.* The name "electric discharge" is especially applied to cases in which the escaping electricity produces luminosity. Three kinds of such discharges have been distinguished—the *spark*, the *brush*, and the *glow.* The spark is accompanied by a sound which varies from a faint crack to a loud bang. In

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nature it is seen on the largest scale in the case of lightning, which is a discharge of atmospheric electricity. In many cases the electric spark presents no definite shape, but looks like a mere point of fire, or, if very bright, is enlarged by its dazzling effect on the retina; but when it leaps across a space of several inches of air it assumes a crooked shape bearing a remarkable resemblance to a flash of lightning. The *brush* discharge is only faintly luminous. It occurs especially at sharp points and edges of highly-charged bodies. It is barely visible by daylight, and its appearance in the dark is that of a luminous halo. It projects only a small distance into the air surrounding the body from which the charge is escaping. The *glow* discharge simply renders the surface of the body luminous, and does not extend into the air at all. In some modern electric apparatus beautiful effects of electric discharge are shown. Thus by causing a discharge to take place in highly-rarefied air or gas it is made to jump across a considerable interval, and the whole intervening space is filled with a beautiful nebulous luminosity, the color of which depends on the nature of the gas. If the vacuum is sufficiently good the luminosity is seen to be disposed in transverse stripes, technically called *striæ*.

Dissipation of Electricity.—An electrified body left to itself gradually loses its electricity. This effect is due to more causes than one. If the body is a conductor and has any sharp points or edges these afford a ready channel for the escape of the charge into the air. Some loss occurs by particles of dust in the air being attracted to the body and then repelled after coming in contact with it. But the chief loss in the case of a smooth conductor on insulating supports usually occurs by leakage over the surface of the supports, owing to a thin film of moisture from which it is difficult to keep them free. This is especially the case with glass supports. Dissipation can be almost completely prevented by surrounding the electrified body with an artificially dried atmosphere. The most usual means of doing this is to place a shallow dish of sulphuric acid in the closed vessel in which the body is contained. The loss by dissipation can thus be reduced to one or two per cent. of the entire charge per diem.

Distribution of Electricity.—When a conductor has a permanent charge there is no electricity in its interior. The charge resides entirely at the surface, and is not *distributed* equally over the whole surface, but is thickest (so to speak) at those parts which project most. At sharp edges, and still more at sharp points, the density is exceedingly great, and hence the electricity has a strong tendency to leak away.

Electric Currents.—What is known as an electric current is a peculiar condition of a wire or other conductor of electricity, in virtue of which it deflects magnetic needles in its neighborhood, magnetizes a piece of soft iron round which it is coiled, has its own temperature raised, and exhibits various other effects. This condition of a wire occurs both in connection with frictional and voltaic electricity, and can be produced by attaching its ends to the two terminals of a galvanic battery, or to the two terminals of a magneto-electric machine, and in various other ways. An electric current may be regarded at pleasure as consisting in the flow of positive electricity in one direction through the wire in question, or of negative electricity in the opposite direction, or of both electricities simultaneously one in each direction. What is conventionally called the direction of the current is the direction in which the positive electricity may be regarded as flowing. The "strength" of a current denotes the quantity of electricity that passes through the wire in the unit of time. The deflecting force which a current exerts on a magnetic needle—other things being equal—is proportional to the strength of a current; but the quantity of heat which it generates in a given time is proportional to the square of its strength. One effect of currents is the decomposition of certain chemical compounds, and this effect, like that first mentioned, is simply proportional to the strength of the current. Instruments for measuring the strengths of currents by chemical decomposition are called *voltmeters*, and instruments for measuring them by the deflection of magnetic needles are called *galvanometers*. The currents by which telegraphs are worked are usually obtained from galvanic batteries; but the far stronger currents required for electric lighting are usually produced by machines called *dynamos* driven by steam or water power. The currents in such machines are due to magneto-electric induction.

Electro-dynamics is that branch of electrical science which treats of the attractions and repulsions exhibited between wires or other conductors through which currents are passing. If two wires are parallel, they will attract each other when currents are passing the same way through them both, and will repel each other when the currents are opposite. If the wires are inclined to each other at any angle, there is not only an attraction or repulsion, but a still more marked tendency to rotation which is not satisfied till the wires have become parallel and the currents flow in the same direction through them both. When there are only two straight wires these forces are feeble and require delicate apparatus for their exhibition; but by employing coils of wire the forces are multiplied, and an instrument constructed on this principle called the *electro-dynamometer* has been much employed for the measurement of currents. The whole science of electro-dynamics is due to Ampère who discovered its main facts, and reduced them by ingenious experiments, combined with very abstruse reasoning, to a single mathematical formula which includes them all.

Velocity of Electricity.—Daily experience with the electric telegraph shows that electrical action is propagated with great rapidity. The time that intervenes between the sending of a signal from one station and its visible effect

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at another, depends on a variety of circumstances. The time is notably longer for underground or submarine wires than for wires suspended in the air on poles. When one end of a long submarine or subterranean telegraph wire is suddenly put in connection with a galvanic battery or other source of electricity, the current which flows out of the other end into the earth does not begin sharply but gradually, and takes a measurable time to attain its full strength. Hence an instrument which is delicate enough to show a very feeble current, will show the effect earlier than one which requires a strong current to move it. An instrument in which the moving parts are small and light has also an advantage over one in which they are large and heavy. Something, too, depends on the nature of the source of electricity employed. A source which acts with sudden violence, like the discharge of a Leyden jar or an induction coil, will make the effect appear earlier than a comparatively gentle source, such as an ordinary galvanic battery. Electricity has not a definite velocity like light or sound. It is rather comparable to waves on water, which travel with very various speeds according to their length and the depth of the water. The highest speed ever observed in the transmission of electric effects was that obtained by Wheatstone in his celebrated experiment with a rotating mirror. In this experiment a Leyden jar was discharged through half a mile of wire with three interruptions in it, at each of which a spark was formed by the electricity leaping across. One interruption was in the middle, and the other two were at the ends, one end being close to the knob of the jar, and the other end close to its outer coating. The wire was so arranged that all three interruptions were near together; and by observing the reflections of the three sparks in a rotating mirror, he was able to discover that the middle spark occurred sensibly later than those at the two ends, these latter being simultaneous. The lagging of the middle spark behind the other two was regarded as the time that electricity took to travel through a quarter of a mile of wire, and the velocity thus found for electricity was 230,000 mi. per second, a velocity greater than that of light, which is between 185,000 and 186,000 mi. per second. Observations made in connection with the use of the electric telegraph for determining longitudes, have shown that the time which intervenes between the sending and receiving of a signal was about four tenths of a second between Aden and Bombay, two tenths of a second between Alexandria and Malta, two tenths between Malta and Berlin, and about one eighth of a second between Greenwich and Valentia.

Electrical Theories.—If we endeavor to explain electrical phenomena by regarding electricity as a substance, we are met by two difficulties: one is that electricity adds nothing to the weight of a body; the other is that electrical phenomena are dual, as if there were two opposite kinds of electricity which destroy each other when they unite. Du Faye maintained the existence of two electrical fluids endowed with opposite qualities, and called them the *vitreous* and the *resinous* fluid. Franklin endeavored to account for the same phenomena by assuming the existence of a single electric fluid, and supposing an electrified body to be a body which possesses either more or less than the normal quantity of this fluid. If more, it was said to be positively, and if less, negatively electrified. Franklin's *positive* and *negative* corresponded with Du Faye's *vitreous* and *resinous*. Whenever electricity is generated the two opposite kinds are always produced in exactly equal quantity. Modern theories favor the idea that electricity is not a substance or a pair of substances, but a special kind of motion, and that the two opposite electricities are two opposite states of motion of the particles of a medium which is believed to pervade all bodies and all space; the same medium whose vibrations constitute light.

Applications of Electricity.—The employment of electricity commercially and industrially is daily increasing in importance, The electric telegraph has long been familiar, and the telephone is now almost equally so. Electric lighting is rapidly extending, and electric railways or tramways are increasing in number. The operations of electro-metallurgy are also of great importance.

The Electric Transmission of Power is the transmission of power to a distance by electricity, effected by employing the source of power to drive a machine called a *dynamo* which generates an electric current. This current is conveyed by a copper conductor insulated from the earth to the distant station, where it passes through a machine called an *electro-motor*, one part of which (called the armature) is thereby made to revolve, and imparts its motion to the machinery which is to be driven.

This is the simplest arrangement, and is that which is commonly employed when the original currents are not of such high tension as to be dangerous to life in the case of accidental shocks. There is, however, a great waste of power in employing low-tension currents when the distance is great; hence it is becoming a common practise to employ high-tension currents for transmission through the long conductor which connects the two stations, and to convert these into low-tension currents before they reach the houses or workshops where they are to be used. This is done sometimes by employing the high-tension currents to drive a local dynamo which generates low-tension currents, sometimes by employing them to charge storage cells arranged in long series, and afterward connecting these cells in shorter series. The discovery that a Gramme machine is reversible—that is to say, when two Gramme machines are coupled together, one operating as a generator the other will act as a motor—was an important step taken in the transmission of power. Numerous efforts, since then, have been made to utilize electricity for the transmission of power over a

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long range. For this purpose the alternating current seems eminently adapted. The possibilities offered by electrical transmission of water power for sections of country favored with waterfalls are numerous, and should result in making them great industrial centers. Already arrangements have been made to utilize the immense power now wasting at the Niagara Falls by electrical transmission. From a point above the Falls to a point below, a tunnel through the rock has been completed and has developed 125,000 horse power, which is carried to Buffalo, N. Y., and other points.

The phrase, "*distribution of electricity*" has been used during the last few years to denote the supplying of strong currents of electricity from central stations where they are germinated, to houses, street lamps, etc., in their vicinity. The central station contains a few powerful dynamo machines, driven usually by steam power. The positive and negative terminals of the dynamo are put in connection with the positive and negative main conductors which are to supply the district, and from these mains smaller conductors branch off to the houses or lamps. All these conductors are of copper, that metal when pure having seven times the conductivity of iron. Different methods are in use for keeping the supply of electricity steady in spite of the varying demands made upon it. In some systems of distribution, instead of the two main conductors being one positive and the other negative, each is positive and negative alternately, the reversals taking place some hundreds of times per second. The currents are then said to be *alternating*. When such reversals do not take place, the currents are said to be *direct*.

To produce electricity direct from heat, without the intervention of steam boilers, engines, and dynamos, has been the dream of electricians for years. In the latter part of 1896, Dr. W. W. Jacques of Boston, Mass., discovered that if oxygen, whether pure or diluted, as in air, be caused to combine with carbon, not direct, as in the case of combustion, but through an intervening electrolyte, the energy of the carbon may be converted directly into electrical energy instead of into heat. Practically the active or oxidizing element of the Jacques cell is supplied with an excess of oxygen by means of an artificial air blast or air pump. The electrolyte, whose first action after the cell is set up, is to release its oxygen and so permit it to attack the carbon, is thus continually renewed by fresh charges of oxygen, which are at once carried to the carbon for a continued attack. The carbon is consumed and electrical energy is developed in a corresponding degree, the rate of consumption and the strength of the electric current being gauged by the rapidity with which the air is supplied to the electrolyte compound.

The generating apparatus of the Jacques cell consists of a pure iron pot, surrounded by a suitable furnace, and containing caustic soda, into which extends a circular piece of carbon. An air pump forces into the caustic soda an excess of oxygen. One pole is the carbon cylinder, the other is the iron pot. The apparatus is set in operation by bringing the furnace and its enclosed generator and electrolyte of caustic soda to a temperature of about 1,000°. From a battery of 100 Jacques cells, each 12 in. deep and 1½ in. in diameter, a current has been obtained averaging about 90 volts and supplying 30 16-candle power incandescent lamps 19 hours.

X-Rays is the popular name of the phenomena caused by the discharge of electricity through highly rarefied air, gases, and vapors. It was given that name by Prof. Roentgen, the eminent German scientist, who first produced "shadowgraphs," or photographs of substances which are opaque to ordinary light, because scientists differed as to the exact nature of the rays. They are called "cathodic" rays because they emanate from the kathode (or cathode), the negative electrode in Crookes's tube. In 1857 Dr. Heinrich Geissler, a celebrated German scientist, passed a current through a tube from which the air was exhausted. The tubes were made of thin glass, and in each end platinum wire passed through to the inside of the tube. These were the well-known Geissler tubes, which for many years have been used to illustrate the phenomena which accompanies the discharge of electricity through highly rarefied gases and vapors. The platinum wires usually were tipped with small spheres or disks of platinum or aluminum. When the terminals of a secondary coil were connected with the electrodes of the tube, and an electric current was sent over the wires, various colored-light effects take place in the tubes. Dr. Crookes, an English scientist, succeeded in exhausting the air in a Geissler tube to a much higher degree than Geissler was able to do. The exhaustion was carried as high as the one twenty-millionth of an atmosphere. In experimenting with a Crookes's tube, Prof. Roentgen discovered that the rays from the cathode electrode possessed the power of passing through opaque substances such as leather, paper, wood, flesh, and other materials that cannot be penetrated by ordinary light. He found that the radiation acted on sensitive photograph plates, so that he was able to produce shadows of substances which, in varying degrees, retarded the passage of the cathodic rays. For instance, he was able to photograph coins concealed in leather pocket books; the bones of the hand, arm, leg, etc., lead pieces hidden away between the leaves of a thick book, nails in a block of wood, etc. He gave his discovery to the world in the early part of 1896, and at once the Roentgen X-rays caused a furore in the scientific world. It was found that the X-rays could be used for locating fractures of bones, bullets, and other foreign substances in the human body, and at last the entire skeleton of small birds and animals was photographed by interposing the living body between a Crookes's tube and the photographic plate. Development of the X-rays extended until it was possible and practical to show the entire human skeleton on a phosphorescent screen.

The Crookes tube generally employed is irregularly globular in form, with the cathode tipped with an aluminum button or circular plate. It is actuated by a storage battery or other source of electricity through a Ruhmkorff coil or other form of spark coil. The Crookes tube is placed on one side of the hand, body, or other object to be "skiagraphed" and the X-rays, passing through the object, affect the sensitive plate, and a shadow picture is the result. This process is called "skiagraphing." The picture is not a photograph, in the ordinary sense of the word, but is a shadow, in which the deeper or darker parts take the form of the material which offers the greatest resistance to the passage of the X-rays. In practise the current is automatically broken many times a second. X-rays are a form of radiation which some scientists believe is similar to the etheric vibrations that produce the phenomena of light, electricity, heat, magnetism, etc.

Electric Light, a light obtained through heating a suitable body to incandescence by causing a current of electricity to pass through the body. The substance usually employed for this purpose is carbon, which has two recommendations: first, its power of bearing a very high temperature without melting; and secondly, its high emissive power, which is the source of most of the light in the flame of a candle, an oil lamp, or a jet of gas.

Until quite recent years the only kind of electric light in practical use was what is now called the *arc light.* The arc light is obtained by causing two sticks of carbon, one of them in connection with the positive and the other with the negative terminal of a battery or dynamo, to touch each other for an instant so as to complete the circuit, and then separating them and keeping them steadily at a small distance apart. Before the carbons have touched, the cold air between them prevents the current from passing, but as soon as they touch they become intensely heated, and if they are not separated too far the air between them is hot enough to serve as a conductor. The light is emitted partly by the ends of the carbons, especially of the positive carbon, and partly by the gaseous matter (containing also fine particles of solid carbon) which occupies the intervening space and forms the *arc* or streak of light joining the two carbon points. When the source of electricity is an alternating current machine each carbon is alternately positive and negative several times in a second, and the two points behave alike. When the source is a direct current machine or a galvanic battery the positive carbon wears away about twice as fast as the negative, and the positive carbon becomes hollow at the end, while the negative remains pointed. The hollow in the positive carbon is the brightest part of the whole arrangement; and when a beam of light is to be thrown in some definite direction, care should be taken that this hollow is exposed to view in that direction.

To keep the carbons at the proper distance apart a special contrivance called a "regulator" is employed. There are many varieties of regulator, but they all depend on the principle that increase of distance between the carbons causes increase of resistance. They usually contain an electro-magnet through which either the whole or a portion of the current passes, and the variations in the strength of this magnet arising from change of resistance are taken advantage of to cause the motion, in one direction or the opposite, of a piece of iron which locks and unlocks the mechanism.

As regards the material of the carbon sticks, Sir Humphry Davy used pieces of wood charcoal, and the substance deposited in the interior of gas retorts has sometimes been employed, but it is now usual to employ a mixture of powdered carbon (from gas retorts), lampblack, syrup, and gum, with a very little water. The sticks are obtained by forcing this pasty mixture through a draw plate; they are then baked, and after being again impregnated with syrup, are heated to a high temperature.

Arc lights give the largest amount of light for a given amount of horse power expended in driving the dynamo; but incandescent lights, which have been introduced by Edison, Swan, and other inventors of late years, possess several advantages. Owing to the absence of oxygen, there is no combustion in an incandescent lamp, and hence the carbon does not waste away. The want of means to obtain a sufficiently good vacuum was the chief cause which prevented the earlier introduction of such lamps. Sprengel's mercurial pump, with Crookes's improvements, has supplied this want. All the incandescent lamps agree in having a carbon filament suspended *in vacuo*, but they differ in the mode of preparation of the carbons and in other details.

The light of an incandescent lamp is extremely steady, affording a great contrast to the flickering which is never altogether absent from arc lights. Its temperature is lower, and hence its color is not blue or violet, like that of most arc lights, but slightly yellow, though whiter than gas. It is superior both to gas and to the arc light in giving off no products of combustion to vitiate the air of an apartment. The Jablochkoff light occupies an intermediate place, but more nearly resembles the arc lamps. It is lighted by temporarily inserting a piece of carbon to connect the ends of the two sticks; and after a fair start has once been obtained, the top of the plaster of paris is hot enough to act as a conductor. Its incandescence contributes a portion of the light of the lamp, and it gradually burns away so as never to project quite as far as the carbons. Alternating currents are now always used with it, as the two carbons may then be exactly alike and will wear away equally.

The introduction of electric lights for commercial uses may be said to date from the lighting of the Avenue del Opéra at Paris by Jablochkoff lamps, a few years previous to the Paris Electrical Exhibition of 1881. The electric light, as previously known, was considered

too dazzling for street purposes, but the Jablochkoff "candles," which, even when naked, are far less dazzling than "arc" lights, were concealed from direct view by opal globes, and instead of single points of dazzling brightness, presented an appearance like a row of full moons. Inventive ingenuity has been largely expended upon the details of electric lighting, as the records of the Patent Office will testify —for cut-outs, arc-lamp regulators, sockets and keys, dynamo regulation, systems of distribution, etc. The generator has attained an unrivaled degree of perfection, almost 95 per cent. of the power obtained being yielded as electric energy. The continuous current-dynamo is now a work of art. The various steps of its construction are operations of peculiar skill. The electric light has been applied to a great many special uses; for instance, in dentistry and surgery the incandescent lamp is used to explore hidden recesses of the human frame, and on ships the arc lamp is a searchlight. In submarine work electric lighting has proven of great value. Street lighting with arc lamps has had an enormous development, and nearly all towns of any progress in the U. S. have their streets electrically lighted. The extraordinary development in the application of alternating currents is specially notable. This system of lighting has spread with such rapidity that it is now in general use all over the U. S. The meter has received its due share of attention from the unwearying inventor, more than 200 patents from the U. S. Patent Office having been issued for direct and alternating currents.

In 1896, Nicola Tesla, and D. McFarlane Moore, American electricians, exhibited still another form of electric light. This is called "fluorescent" and "glow" lights, and is obtained by the passage of electric discharge through the rarefied gas in a vacuum tube. In such light there is no combustion and only a very little heat. Moore has succeeded in filling tubes six feet long and three inches in diameter with a bluish white light, and Tesla, by employing a current of extremely high frequency and high tension has developed an intense electro-magnetic field, so that he is able, by merely placing an exhausted lamp bulb within this field, to produce a glow without use of conducting wires. This method of electric lighting at this time (1899) is yet in the experimental stage.

Electric Machine, any machine for producing powerful electrical effects. The name is, however, seldom applied to machines depending on magneto-electric principles, and is practically confined to two classes of machines—those which act by friction, and those which act by electrostatic induction. The former are called Friction Machines and the latter Influence Machines. For many years the former were the only kind known, but they have now been almost superseded by the latter. In friction machines the electricity is generated by the friction of either a glass cylinder or a circular glass plate against cushions covered with an amalgum of zinc and tin. The positive

electricity which is thus developed on the surface of the glass is given off to an insulated brass conductor furnished with teeth like those of a comb, the sharp points of which are nearly in contact with the glass. The negative electricity which is at the same time generated on the cushion must be provided with some means of escaping, or the action of the machine would soon stop. It is usually allowed to escape to the earth by a brass chain connected with the cushions; but in some machines a negative conductor connected with the cushions is insulated like the positive conductor by a glass support. Negative sparks can then be drawn from this conductor at the same time that positive sparks are drawn from the other.

Electric "power" is a phrase of such common usage that it has reached the dignity of an accepted term. As a matter of fact, electricity, in itself, is never a source of power. It is an agency, a form of energy, by which mechanical power may be transferred from an ordinary *prime mover*, as a steam engine, water wheel, or wind mill, to a secondary motor. The motor is that which does the work. In its important application to machinery, electricity performs an office similar to that performed by a line of shafting, a belt, cable, rope, or a pipe filled with compressed air; it transmits power. Although some small motors are energized or driven with batteries as the source of power or energy; and some have the initial power producer in the form of windmills and water wheels, the bulk of the work done by the electric motor has the stationary steam engine as the prime motor mover.

The steam engine drives the dynamo; the dynamo, the generator of the electric current, is connected by wires, called conductors, with the motor. When the motor is used to propel machinery, it takes the place of the steam engine, and by means of shafting, belts, or other mechanical appliances for transmitting power, gives motion to machinery. Another, and a rapidly extending method of employing electric motors for propelling machinery, is to give each machine or group of machines in a machine shop, railroad shop, printing establishment, etc., such motors, being connected with the dynamo in the engine room. By this method, the use of power, wasting, shafting, and belting either is entirely discontinued, or such appliances are used simply when one motor operates a group of machines.

It is estimated that shafting and belting absorb over 30 per cent. of the gross power of engines before the delivery of any power whatever for actual work. Thus the electric motor, installed for operating individual machines, or groups of machines, directly saves money by removing the wasteful loss of power due to the friction and weight of belting and shafting. The development of the electrical industry may be shown by the single fact that in 1886 there were less than 5,000 electric motors used in the U. S. At least 4,000 were driving small fans and sewing machines. At that time a 10-horse power motor was consid-

ered very large, and it was estimated that less than 50 such motors were in use. In 1897 over 500,000 electric motors are used. Motors of over 100 horse power are common, and there are some of over 1,000 horse power in actual use. In some establishments over 500 motors are in use, aggregating, in some cases, more than 6,000 horse power. Concerns that use 100 or more motors, requiring for their operation from 1,000 horse power and upward, are common. In many cities and towns, a central power station, generally also used for electric lighting, furnishes "power" for motors to their subscribers.

Wherever there is water power in a community of any considerable size, the water wheels drive the dynamos, which generate electricity for motors. In some of the northwestern states power obtained from the flow of water from artesian wells, is transformed into electric energy, which furnishes electric light and electric "power." The most notable instance of electricity generated with water power used as a prime mover, is to be found in the immense hydraulic work of Niagara Falls.

Electric Railways.—In its application to railroads and street railways, electricity has made marvelous strides. Electricity is capable of being supplied to a moving motor through frictional or rolling contact. No other agency capable of transmitting power possesses this all-important quality. So it is, that by means of wires or other forms of conductors, extended along the road-bed of the railway, in such wise that the "trolley wheel" contact shoe, or other form of contact, can readily touch the conductor, the electric current is supplied to the motor no matter how swiftly the motor travels. As early as 1864 Jean Henry Cazal, a French engineer, proposed to utilize natural powers; such as water, air, and wind for operating railways, by the electrical transmission of power. In 1879 Dr. Werner Siemens exhibited an electric railway at the Industrial Exhibition in Berlin. This railway was circular, about 1,000 ft. long, and the motor was five horse power. Thomas A. Edison was the first to construct an actual dynamo-electrical railway in America. This was done in the spring of 1880, at Menlo Park, N. J., the track being 90 rods in length. Stephen D. Field, of California, exhibited an electric locomotive at the Exposition of Railway Appliances in Chicago, June, 1883. Both Edison and Field utilized the rails of the track to convey the current to the motor. Dr. Joseph R. Finney of Pittsburg, is credited with the invention of the "overhead trolley" system of electric traction. In 1882 his first experimental car was exhibited and successfully operated in Allegheny, Pa. A suburban line, 2 mi. in length extending from Baltimore to Hampden, Md., was the first electric street railway operated in America for actual commercial service. It was put in operation Sept. 1, 1885. In 1888, all the street railways of Richmond, Va., were equipped with electric motors. In 1898, according to Poor's Manual of Railroads, there were 15,678 mi. of

Electric Railways

electric street railway in operation in the U. S., divided among the states as follows:

State.	*Miles.*	*State.*	*Miles.*
Alabama	120	Mississippi	6
Arizona	6	Missouri	529
Arkansas	34	Montana	65
California	557	Nebraska	152
Colorado	215	N. Hampshire	80
Connecticut	417	New Jersey	686
Delaware	35	New York	1,862
Dist. of Col.	159	N. Carolina	37
Florida	44	Ohio	1,374
Georgia	225	Oregon	117
Idaho	4	Pennsylvania	1,679
Illinois	1,365	Rhode Island	181
Indiana	395	S. Carolina	50
Iowa	290	S. Dakota	8
Kansas	110	Tennessee	237
Kentucky	188	Texas	224
Louisiana	190	Utah	92
Maine	230	Vermont	77
Maryland	348	Virginia	211
Massachusetts.	1,632	Washington	211
Michigan	572	W. Virginia	45
Minnesota	301	Wisconsin	318

Electric railways may be divided into four classes: 1, The "overhead system," commonly called the "trolley" system, in which the current for the motor is taken from a wire suspended over and parallel with the tracks. 2, The "third rail system," in which a rail, running parallel, either to one side or between the rails of the track, is the conductor. 3, The "conduit or underground system" in which the conductors are placed in a trench or conduit below ground. 4, The "storage battery system," in which the current is furnished by storage batteries, charged at the power station, and carried on the motor cars. The overhead or trolley system, is the one used almost entirely for electric street cars in the U. S.

The standard overhead system can be described as follows: In addition to the road-bed, rails, and cars common to all street railways, there is a "power plant," at some convenient point on the line, where the steam boilers, engine, and dynamo for generating the electric current, are stationed. The current generated by the dynamo is conducted by a wire to the "main conductor" or "feed wires," which are carried on posts along the street railway line. Over the center of the track, and running parallel with it, is the "working conductor," or "trolley wire" as it is commonly called. The working conductor is divided into sections, each one or more miles in length, and each station is supplied with currents from the main conductor; thus, a break in any one part of the circuit will not cause any interruption of the circuit. The current on the working conductor or trolley line, is led down to the motor through the trolley, a wheel at the end of a pole which projects upward from the roof of the electric car. The trolley wheel is in continual contact with the trolley wire, and the current passes down the trolley pole by means of a wire to the motor, which is connected by gearing with the axles of the car.

After passing through the motor, the current passes into the wheels of the car, and thence into the track. The rails of the track are connected together with copper wire, furnishing a continuous conductor to lead the current back to the dynamo, thus completing the circuit. In addition to the track connection, the earth is employed as a conductor. At intervals large plates of metal are buried in the wet ground, and wires lead from the rails to the buried plate. Before the current reaches the motor, it passes through the controller which is to the electric car what the throttle valve and reversing lever are to the steam locomotive. The motorman, by moving the handle of the controller starts the car and regulates the speed and shuts off the current. He can also reverse the motor, thus aiding the brakes in making an emergency stop. The "third rail" system, in a general way, has much of the construction of the overhead system, but its working conductor is a third rail, placed on insulated supports, which in turn rest on the cross ties. A sliding shoe moves with the car over the third rail, and thus "picks up" the current, which then goes through the controller, motor, etc. The modern third rail system had its real beginning on the Intramural railroad of the World's Columbian Exposition in Chicago, 1893. It is intended to be used where electric motors are substituted for steam locomotives, and on railroads whose road-bed is so well protected by fencing or by reason of being elevated that danger due to the electric current is reduced to the minimum. The most notable instance of the use of the third rail system is the Metropolitan elevated railway in Chicago. It is the first railroad built with the design of using the third rail system.

The underground or conduit system of electric traction employs a trench, channel, or conduit which extends under the tracks. In this conduit the working conductors are laid, and contact is secured either by trolley wheels or a sliding shoe attached to an arm which extends down under the motor car.

The storage battery system employs storage batteries which are carried in the motor car, and which are charged at the power plant of the railway. As yet there is more or less doubt as to the practicability of the storage battery system, but its advocates claim that the plan is feasible and eminently practical. Several lines are operated with storage batteries in the U. S.

Electro-dynamometer, an instrument used for the measurement of electric currents by means of the mechanical forces which they exert upon each other. It contains two coils of wire, one fixed and the other movable; the latter being either larger or smaller than the other so as to be able to pass either outside it or through it. Both coils are in vertical planes and have the same vertical diameter, round which the movable one can revolve so as to set its own plane at an angle with the plane of the other. The terminals of the movable coil dip in cups of mercury, one of which is in connection with one end of the fixed coil, and the

other with one of the binding screws of the instrument. The other binding screw is in connection with the other end of the fixed coil. Hence when the two binding screws are connected with a battery or some other source of electricity, the current has to pass through both coils. Its effect is exhibited by a tendency in the movable coil to set its plane in coincidence with that of the fixed coil, and in such a manner that the current will circulate the same way round both coils. This tendency is resisted by mechanical means provided for the purpose—usually by the torsion of a wire from the end of which the movable coil hangs; and the measurement is usually made by applying torsion until the planes of the two coils are at right angles. The amount of torsion thus applied is proportional to the mutual force exerted by the two coils, and this is proportional to the square of the current, since when we double the current through one we also double the current through the other.

Electrol'ysis, is the chemical decomposition of certain compound bodies under the action of a current of electricity. The following are the main facts to be mentioned. When an *electrolyte* (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient intensity, it is broken up into two elements, which appear, one of them at one electrode and the other at the other electrode; thus, if two platinum plates connected with the first and last plates of a battery be plunged in a trough containing a solution of chloride of silver, the chlorine is given off at the plate by which positive electricity enters, that is, at the plate which is connected with the copper plate of the battery, and the silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for every 108 grams of silver deposited at one side of the vessel 35.5 grams of chlorine are given off at the other side. When a compound consisting of a metallic and a nonmetallic part is decomposed, the nonmetallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. Hydrogen acts as a metal. Electrolysis takes place only when the electrolyte is in a liquid state, and involves a transfer of the materials of which the compound is composed from one part of the vessel to another.

The electrolytic action of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance, all *in series* (that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be the same weight of silver deposited at one side, and the same weight of chlorine set free at the other.

The same quantity of electricity decomposes chemically equivalent quantities of different electrolytes. If we pass the current through a series of cells containing different electrolytes, for example, water, chloride of silver, sulphate

of soda, and collect the products of decomposition, we find that the quantities of hydrogen, silver, and sodium set free are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action which goes on in each of its cells is chemically equivalent to that in each of the decomposing cells.

The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. Currents are often measured in practise by observing the weight of copper deposited in a given time from a solution of sulphate of copper.

Electro-magnet, a piece of iron temporarily converted into a magnet by means of a current of electricity sent through a wire which is coiled round it. The wire is usually covered with silk, cotton, gutta percha, or some other insulator, to prevent the current from leaping across, and to compel it to travel through the whole length of the wire. The more pure and soft the iron is, the stronger will its magnetism be while it lasts, and the more completely will it disappear when the current stops. Steel is less affected than soft iron for the time, but remains permanently magnetized after the current ceases. Electro-magnets are usually much more powerful than other magnets of the same size. The iron which is magnetized by the current passing round it is called the *core.* It is frequently straight, the wire being wound upon it like thread upon a reel; but very frequently it has the shape of a U, or horseshoe, the wire being coiled round the two ends and the bend of the U left uncovered.

To predict which end will be the north pole, the following rule may be employed: Let the core be a straight bar of iron held in front of you pointing left and right, then if the current ascends on the side next you, and descends on the further side, the north pole is to your left hand the south pole to your right. If the straight bar is then bent into horseshoe shape, its poles will not be changed. There is no necessity to inquire whether the wire forms a right-handed or a left-handed helix, this circumstance having no influence on the question of poles. Indeed, in most cases (just as in the case of thread on a reel) the helices are some right-handed and some left-handed.

An electro-magnet is said to be *made* when the current is sent through its coil, and *unmade* when the current is stopped. In some applications of electro-magnets it is necessary to make and unmake them in rapid succession. It is then preferable for the core to consist of a bundle of iron wires rather than of a solid bar.

Electro-magnetism, a term that in its broadest sense denotes the science which treats of the relation between magnetism and electricity. In a narrower sense a magnetic effect produced by electricity is said to be *electro-magnetic,* while an electrical effect produced by the agency of magnets is called *magneto-electric.* In the preceding article we have described

one electro-magnetic effect—the making of an electro-magnet by means of a current. Another important electro-magnetic effect is the deflection of the magnetic needle by a current of electricity passing near it. The simplest experiment to illustrate this action is to take an ordinary mariner's compass, hold just above it a copper wire parallel to the needle of the compass, and then, while the wire is in this position, let its two ends be connected with the two poles of a galvanic battery. The needle will instantly turn away from its north-and-south position, and will remain deflected as long as the current continues to pass over it. If the current flows from south to north, the north end of the needle is turned to the west; and if the current is in the opposite direction, the needle turns the other way. This is the easiest test for determining the direction in which a current is flowing through a wire; and it is the basis of the construction of *galvanometers,* which are the instruments chiefly employed for the measurement of currents. The current tends to make the needle take a position at right angles to the direction of the current; but as the earth tends to make the needle point north and south, the position actually taken is between the two. The fact that a current deflects a needle was discovered by Œrsted of Copenhagen, and the general rule for the direction of the deflection was thrown into the following form by Ampère: *Imagine the current to enter at your feet and come out at your head, then the north pole of a needle in front of you will be deflected to your left.* This rule holds good whether the current is above the needle, below it, or in any other position. The rule may also be put in the following form: Imagine an ordinary screw placed so that the current is in its axis; the north pole of the needle will turn to the same side to which that part of the circumference which is next it turns when the screw advances in the direction of the current.

The leading fact of *magneto-electricity* is that when a magnet is moved in the neighborhood of a wire or other conductor, the motion causes a current of electricity in the conductor; and a similar effect occurs if the wire is moved while the magnet remains at rest. In the experiment above described, of making a magnetic needle turn on its pivot by sending a current through a wire held above it, the motion of the needle produces for the time being a weakening of the current. If the needle were made by mechanical means to turn the contrary way, it would strengthen the current for the time being. If there were no original current, the turning of the needle to either side by mechanical means would produce a current in the wire. The current thus produced is always opposite in direction to that which would aid the motion.

Electro-metal′lurgy, the art of depositing metals from solutions of their salts upon metallic or other conducting surfaces by the agency of an electric current. Its operations may be classified under three heads: the making of facsimiles, the formation of permanent coatings, and the obtaining of a pure metal

from an impure. In every instance the current enters the solution by a plate of the metal in question, which is immersed in it, and leaves the solution by the conducting surface on which the deposit is formed. The plate at which the current enters (called the *anode*) is gradually dissolved, and an equal quantity of the metal is at the same time deposited on the surface by which the current leaves the solution (called the *cathode*). The source employed for giving the current was formerly a galvanic battery, but is now more frequently a dynamo machine, in which the armature is constructed of much stouter wire than is used in dynamos intended for other purposes. Copper lends itself with special readiness to electrical deposition, and the solution employed for the purpose is usually a saturated solution of sulphate of copper; but if the surface to be coated is of iron, steel, or zinc, it is necessary to employ an alkaline solution, in which cyanide of potassium and carbonate of soda are usually the chief ingredients, a salt of copper being present in comparatively small quantity. For electro-gilding, a solution containing cyanide of potassium and cyanide of gold is employed; and for electro-plating, a solution of cyanide of potassium and cyanide of silver. It so happens that the impurities which usually occur in copper roughly smelted from the ore consist of substances which either cannot be dissolved in a solution of sulphate of copper, or cannot be deposited on a copper surface from such a solution. Hence when a plate of crude copper is used as the anode, pure copper is deposited on the cathode, and most of the impurities fall to the bottom of the vessel. Pure copper is now produced in enormous quantities by the method here described, the purity being a most essential requisite in copper wire for electrical purposes. The most important instance of the deposition of a permanent coating is electrotyping, See *Electrotype.*

Electrom′eter, an instrument used for accurate electro-statical measurements. Stated in precise technical language, its purpose is to measure the *difference of potential* between two conductors. Most of the electrometers in actual use are inventions of Sir William Thomson, who was the first to give accuracy to this branch of electrical measurement. His quadrant-electrometer is the instrument chiefly used, and its indications are usually given by means of a small movable mirror which reflects a spot of light from a lamp on to a paper scale. When the two conductors which are tested have the same *potential* the spot of light stands in the middle of the scale, and its movement to either side indicates the difference of their potentials. The instrument is sufficiently delicate to give a sensible displacement when the two conductors are the two plates of a single galvanic cell; and a displacement twice as great will be obtained by combining two such cells.

Electro-motive Force, a phrase (commonly abbreviated into the three initial letters e.m.f.) which is of very frequent use in modern

electrical literature, especially in connection with electric currents. The e.m.f. in a wire through which a current is flowing may be compared to the difference of pressures in a long, narrow, horizontal pipe, through which water is flowing. As the difference of the pressure at the two ends of the pipe forces the water through in spite of frictional resistance, so the difference of the *potentials* at the two ends of the wire forces the current through in spite of the electrical resistance of the wire. This *difference of potentials* is another name for *electro-motive force.* Each cell of a battery is a source of e.m.f., and when the cells are connected in the usual way (technically called *in series*) their e.m.f.'s are added together, so that, for example, the e.m.f. of a battery of ten cells is ten times the e.m.f. of one cell. E.m.f. can also be produced in a wire by moving a magnet in its neighborhood and this e.m.f. will be exactly proportional (other things being equal) to the velocity of the motion. The commercial unit of e.m.f. is the *volt.* Its magnitude may be inferred from the statement that the e.m.f. of a single cell is usually more than one volt, and less than 2½ volts. The highest e.m.f. permitted by the Board of Trade in wires which are liable to be touched by the public is about 200 volts. It is no unusual thing for a dynamo to give an e.m.f. of 1,000 or 2,000 volts. Currents produced by a source of high e.m.f. are often called *currents of high tension.* They are found to be necessary when several arc lamps are to be supplied in series, and they are also necessary (on the score of economy) when power is desired to be transmitted by electricity to great distances.

Electro′scope, any apparatus for showing the presence of electricity without giving quantitative measurements. One form consists of two stiff straws loosely tied together at the top, so that they are free to open out at the bottom whenever they repel each other. If they are placed in conducting communication with an electrified body they will open out. A more sensitive instrument is the gold-leaf electroscope. Here the two gold leaves diverge under the influence of an electrified body held over the instrument. The gold leaves are attached to the lower end of a short rod of brass, whose upper end carries the brass knob which forms the top of the instrument. These metal parts are supported by the glass shade which insulates them from the earth, and the upper part of which is coated with varnish, but this is not essential. The two gold leaves originally hang down parallel, and nearly touching each other. When an electrified body is slowly brought down over the knob from a good height above it, the unlike electricity is attracted to the knob, and the like electricity is repelled into the gold leaves, which, in consequence of being thus electrified, repel each other. The two little brass columns standing up from the base are in connection with the earth, and their presence increases the divergence of the leaves. As soon as the electrified body above is removed, the leaves

come together again. If, however, while the leaves are standing apart under the influence of the body overhead, the knob is touched with the finger, the leaves will instantly come together. It will then be found that either lowering or raising the influencing body causes them to open out again; and if the influencing body is removed they will open out to the same width at which they stood just before the knob was touched. The leaves and knob have now a charge opposite to that of the influencing body, and the electroscope can now be used to show whether the charge of a second influencing body is positive or negative. If the second body has the same kind of electricity as the first, it will diminish the repulsion; if it has the opposite kind, it will increase the repulsion.

Electrotyping consists in making a solid plate of metal by use of a mold and galvanic action, and is performed as follows: A form of type or wood cut is cleansed and dusted with finely powdered plumbago. A type form is laid face upward on a powerful press, a sheet of beeswax upon a lead plate is placed on top of the form and an impression taken in the press. The wax mold so formed is coated with powdered lead (plumbago) to give it a surface for the galvanic current. After the loose particles of lead are blown off, it is washed with a weak solution of sulphate of copper, then dusted with iron filings. It is then suspended in a bath consisting of two parts of sulphate of copper and one part of sulphuric acid placed in the water in the tub. The wax plate is then connected with the negative pole of a battery, and a sheet of copper is hung in front of the wax and connected with the positive pole. The current is then turned on, and the copper is drawn from the plate and deposited upon the wax mold. After several hours it is removed from the bath and the shell of copper is taken from the wax. It is then "backed up" with lead or type metal, planed smooth when cold, the edges finished, and it is ready for the press. The plate when complete is about one-sixth of an inch thick. When placed on the press these plates are mounted upon a block with rachets on the side and foot which make them type high. Electrotype copies of steel engravings are made in practically the same manner as described above. Great care has to be taken, however, in preparing a steel plate so that the copper will not adhere to it.

El′ements, the simplest constituent principles or parts of anything; in a special sense, the ultimate indecomposible constituents of any kind of matter. In ancient philosophies the term was applied to fire, air, earth, and water. The mediæval chemists, however, absorbed in the study of metals and mineral substances, supposed that the metals consisted of an elemental sulphur and an elemental mercury mixed together more or less perfectly and in different proportions. To these were subsequently added salt and some others, so that about the middle of the seventeenth century the first principles amounted to five, divided into two classes; the active, consisting of mercury or spirit, sulphur or oil, and salt;

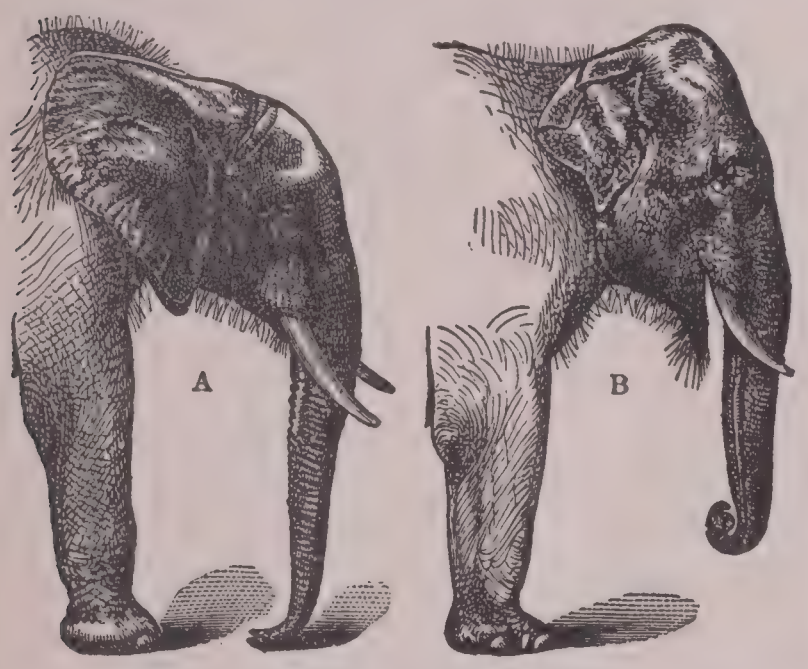
and the passive, consisting of water or phlegm, and earth or the terrestrial part. The names remained, not so much as denoting substances or ultimate principles as gradually coming to denote functions; the first great modification being the expansion of the idea of elemental sulphur into phlogiston by Stahl, as the result of which the adherents of the phlogistic theory applied the term to phlogiston, to the gases then discovered, the mineral, vegetable, and animal acids, the alkalies, earths, and metallic calces, oil, alcohol, and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, who considered as elements, oxygen, nitrogen, hydrogen, sulphur, phosphorus, and carbon, the metals and the earths, and, as Boyle had already suggested, practically defined an element as a body not yet decomposed, the definition now commonly adopted.

El′ephant, the popular name of a genus or subfamily of five-toed proboscidian mammals, usually regarded as comprehending two species, the Asiatic and the African.

Tips of Trunks of (*a*) African and (*b*) Indian Elephants.

From a difference in the teeth, however, the African species is sometimes treated as a distinct genus, and some authors divide the Asiatic elephants into several species, such as the Indian elephant, the Ceylon elephant, and the Sumatra elephant. The so-called white elephants are merely albinos. The African elephant is distinguished from the Asiatic species by its greater height, its larger ears, its less elevated head and bulging or convex forehead, the closer approximation of the roots of the tusks, and the greater density of the bone. It has also only three external hoofs on the hind feet, while the Asiatic has four. All elephants are remarkable for their large, heavy, short bodies supported on columnar limbs, a very short neck, a skull with lofty crown and short face bones, with the exception of the premaxillaries, which are enlarged to form tusk-sockets. To compensate for the short neck, they have the long proboscis, often 4 or 5 ft. in length, produced by the union and development of the nose and upper lip. It is made up of muscular and membranous tissue, the only cartilages being the valves at the entrance of the nares. The trunk is of great strength and sensibility, and serves alike for respiration, smell, taste, suction, touch, and prehension. The tusks, which are enormously developed upper incisor teeth, are not visible in young animals, but in a state of maturity they project, in some instances 7 or 8 ft. The largest on record (possibly that of an extinct species) weighed 350 lbs. Elephants sometimes attain the height of 15 ft., but their general height is about 9 or 10. Their weight ranges from 4,000 to 9,000 lbs. The female is gravid twenty months, and sel-

dom produces more than one at a birth; this, when first born, is about 3 ft. high, and continues to grow till it is 16 or 18 years of age. It is said they live to the age of 100 years and upward. They feed on vegetables, the young shoots of trees, grain, and fruit. They are polygamous, associating in herds of considerable size under the guidance of a single leader. An elephant leaving or driven from a herd is not allowed to join another, but leads a solitary, morose, and destructive life. These are popularly known as "rogues." Elephants are caught either singly or in herds. In the former case it is necessary to catch adroitly one of the elephant's legs in the noose of a strong rope, which is then quickly attached to a tree; another leg is then caught until all are securely fastened. His captors then encamp beside him, until under their treatment he becomes tractable. When a number are to be caught a strong enclosure is constructed, and into this the elephants are gradually driven by fires,



Heads of (*A*) African and (*B*) Indian Elephants.

noise, etc. With the aid of tame elephants the wild ones are tied to trees and subjected to the taming process. The domesticated elephant requires much care, and a plentiful supply of food, being liable to many ailments. The daily consumption of a working elephant is, according to Sir J. E. Tennent, 2 cwts. of green food, about half a bushel of grain, and about 40 gallons of water. Their enormous strength, docility, and sagacity make them of great value in the East for road making, building, and transport. They are used by the great on occasions of pomp and show, being often richly caparisoned, and bearing on their back a howdah containing one or more riders, besides the mahout or driver sitting on the animal's neck. Tiger shooting is often practised from an elephant's back. The fossil remains of the genus *Elephas* indicate the former existence of at least 14 species; and a still larger number of species belong to the allied genus *Mastodon.* The smallest full-grown elephant on record is a dwarf elephant, named *Lili*, from Sumatra. It is 36 in. high and weighs 172 pounds.

Elephan'ta, a small island in the Bay of Bombay. It is celebrated for its rock temples or caves, the chief of which is a cave temple supposed by Fergusson to belong to the tenth century, 130 ft. long, 123 broad, and 18 high, supported by pillars cut out in the rock, and containing a colossal figure of the trimurti, or Hindu trinity, Brahma, Vishnu, and Siva. This temple is still used at certain Hindu festivals.

Elephant Fish, a fish of the order Elasmobranchii (rays and sharks), so named from a proboscis-like structure on the nose; called also southern chimæra. It inhabits the Antarctic seas, and is palatable eating.

Elephanti'ne, a small island of Egypt, in the Nile, opposite Assouan (Syene). It is covered with ruins piled upon each other,—Egyptian, Roman, Saracen, and Arabic,—the most important being a gateway of the time of Alexander, a small temple dedicated to Khnum and founded by Amenophis III, and the ancient Nilometer mentioned by Strabo.

Elephant Seal (the Proboscis Seal, or Sea elephant), the largest of the seal family. There are probably two species, one found only on the coast of California and Western Mexico, the other in Patagonia, Kerguelen Island, Heard's Island, and other parts of the Southern seas. They vary in length from 12 to 30 ft., and in girth at the chest from 8 to 18 ft.

Elephant Seal.

The proboscis of the male is about 15 inches long when the creature is at rest, but elongates under excitement. The females have no proboscis, and are considerably smaller than the male. Both species are becoming rare from their continual slaughter.

Elephant's Foot, the popular name of a plant of the natural order Dioscoreaceæ, distinguished by the shape of its root stock, which forms a nearly hemispherical mass rising a little above the ground, covered with a thick corky bark. It has a slender climbing stem growing to a length of 30 or 40 ft., with small heart-shaped leaves and greenish-yellow flowers.

Eleusinian Mysteries, the sacred rites anciently observed in Greece at the annual festival of Dēmētēr, or Ceres, so named from their original seat Eleusis. As a preparation for the greater mysteries celebrated at Athens

and Eleusis, lesser Eleusinia were celebrated at Agræ on the Ilissus.

Eleu′thera, one of the largest of the Bahama Islands. It is of very irregular shape, its length being about 70 mi., and its breadth in general from 2 to 4 mi., though in one part 10. Pop. over 5,000.

El′evator, 1, a mechanical contrivance consisting of a series of boxes or buckets attached to a belt traveling round two drums, one above and one below, for hoisting grain, meal, etc., into a mill or storehouse from a ship's hold, etc. In the U. S. large buildings containing such contrivances, and in which grain is stored, receive the same name. 2, An apparatus for raising or lowering persons or goods to or from different levels in warehouses, hotels, etc., consisting usually of a cage or movable platform.

Elgin, Kane co., Ill., on Fox River, 38 mi. n.w. of Chicago. Railroads: C. & N. W.; C M. &. St. P.; Elgin, Joliet & Eastern. Industries: watch works, flouring mill, iron foundry, shoe, silver plate, condensing, watch case, and a number of other factories. Surrounding country dairy. Illinois Hospital for Insane located here. The town was first settled in 1835 and became a city in 1854. Pop. 1900, 22,433.

Elgin Marbles, the splendid collection of antique sculptures brought chiefly from the Parthenon of Athens to England by the seventh earl of Elgin (1766–1841) in 1814, and afterward purchased by Parliament for the British Museum at a cost of $175,000 (less than half what had been expended on them). They consist of figures in low and high relief and in the round, representing gods, goddesses, and heroes; the combats of the Centaurs and Lapithæ; the Panathenaic procession, etc. They exhibit Greek sculpture at its highest stage, and were partly the work of Phidias.

Eli, one of the Hebrew judges, the predecessor of Samuel. He was high-priest and judge for forty years. His two sons having been slain and the ark taken in battle by the Philistines, the news proved so severe a shock that he fell and broke his neck, at the age of ninety-eight.

Eli′jah, the most distinguished of the prophets of Israel, flourished in the ninth century B. C., during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram, his special function being to denounce vengeance on the kings of Israel for their apostasy. Elijah at length ascended to heaven in a chariot of fire, Elisha, his successor, being witness.

Eliot, Charles William, educator, b. in Boston, Mass., in 1834. In 1853 he graduated at Harvard College, and in the following year was appointed tutor in mathematics at his *Alma Mater*. He was made assistant professor in mathematics and chemistry in 1858. He taught chemistry in Lawrence Scientific School in 1861. In 1863 he went to Europe, where he studied chemistry. On his return in 1865 he became professor of chemistry in the Massachusetts Institute of Technology. He

was elected president of Harvard University in 1869, which position he still holds. He has done considerable to advance the cause of higher education. He is a fellow of the American Academy of Sciences and has been made LL.D. by Williams, Princeton, and Yale. He wrote a standard *Manual of Qualitative Chemical Analysis*, published in 1869.

El′iot, George (1820–1880), the assumed literary name of Mary Ann, or, as she preferred to write the name in later years, Marian Evans, English novelist. She was the daughter of a Warwickshire land agent and surveyor, and was b. at Griff, near Nuneaton. She received at Coventry an excellent education. Her first literary undertaking was the completion of Mrs. Hennell's translation of Strauss's *Life of Jesus* (1846). After spending two years abroad she boarded at the house of John Chapman, editor of the *Westminster Review*, of which she became sub-editor. It was not, however, until January, 1857, that she came prominently into public notice, when the first of a series of tales entitled *Scenes from Clerical Life* appeared in *Blackwood's Magazine*. The series came to an end in November, 1857, and in the following year the publication of *Adam Bede* placed her in the first rank of writers of fiction. It was succeeded by the *Mill on the Floss*, *Silas Marner*, *Romola*, *Felix Holt*, *Middlemarch*, and *Daniel Deronda*. In addition to those prose works she published three volumes of poems, *The Spanish Gypsy*, *Agatha*, and the *Legend of Jubal*. Her last work published during her life was the series of essays entitled *The Impressions of Theophrastus Such*. In May, 1880, she married Mr. John Cross, but did not survive the marriage many months, dying rather suddenly at Chelsea.

El′iot, John (1604–1690), "the apostle to the Indians," was b. in England, and graduated at Cambridge University. In 1631 he removed to Boston. In 1632 he connected himself with a church at Roxbury, Mass., which connection was not severed until a short time before his death. He learned the language of the Indians, and devoted himself to improving their condition. He translated the Bible into the Indian tongue, and published an Indian grammar. He died at Roxbury, Mass.

Eli′sha, a Hebrew prophet, the disciple and successor of Elijah. Many miracles of prediction and cure, and even of raising the dead, are ascribed to him, but his figure is less original and heroic than that of his master. He held the office of prophet for fully sixty-five years, from the reign of Ahab to that of Joash.

Elix′ir, a word of Arabic origin, applied by the alchemists to a number of solutions employed in attempting the transmutation of metals into gold, and also to a potion, the *elixir vitæ*, or elixir of life, supposed to confer immortality. It is still used for various popular remedies, for the most part composed of various aromatic and stimulative substances held in solution by alcohol.

Elizabeth (1533–1603), queen of England, daughter of Henry VIII and of Anne Boleyn, was b. at Greenwich, and almost immediately

declared heiress to the crown. After her mother had been beheaded (1536) both she and her sister Mary were declared bastards, and she was finally placed after Prince Edward and the Lady Mary in the order of succession. On the accession of Edward VI Elizabeth was committed to the care of the queen-dowager Catherine; and after the death of Catherine and beheadal of her consort, Thomas Seymour, she was closely watched at Hatfield, where she received a classical education under William Grindal and Roger Ascham. At the death of Edward, Elizabeth vigorously supported the title of Mary against the pretensions of Lady Jane Grey, but continued throughout the whole reign an object of suspicion and surveillance. In self-defense she made every demonstration of zealous adherence to the Roman Catholic faith, but her inclinations were well known. On Nov. 17, 1558, Mary's reign came to a close, and Elizabeth was immediately recognized queen by Parliament. The first great object of her reign was the settlement of religion, to effect which a Parliament was called on January 25, and dissolved on May 8, its object having been accomplished. The nation was prepared for a return to the Reformed faith, and the Parliament was at the bidding of the court. The ecclesiastical system devised in her father's reign was re-established, the royal supremacy asserted, and the revised prayer book enforced by the Act of Uniformity. Elizabeth's first Parliament approached her on a subject which, next to religion, was the chief trouble of her reign, the succession to the crown. They requested her to marry, but she declared her intention to live and die a virgin. With the unfortunate Mary, Queen of Scots, were connected many of the political events of Elizabeth's reign. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption by Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. She entered into a league with the Lords of the Congregation, or leaders of the Reformed party; and throughout her reign this party was frequently serviceable in furthering her policy. She also gave early support to the Huguenot party in France, and to the Protestants in the Netherlands, so that throughout Europe she was looked on as the head of the Protestant party. The detention of Mary in England (1568–87), whither she fled to the protection of Elizabeth, led to a series of conspiracies, beginning with that under the earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The state of France consequent on the accession of Henry IV, who was assisted by Elizabeth, obviated any danger from the indignation which the deed had caused in that country; and the awe in which King James stood of Elizabeth, and his dread of interfering with his own right of succession to England, made him powerless. But Philip was not to be so appeased, the execution of Mary lending edge to other grievances. The fleets of Elizabeth had galled him in the West Indies, her arms and subsidies had helped to deprive him of the Netherlands; the Armada was already in preparation. Accordingly he called the Queen of England a murderess, and refused to be satisfied even with the sacrifice she seemed to be prepared to make of her Dutch allies. The Armada sailed on May 29, 1588. Its fate is too well known to need recapitulation. The war with Spain dragged on till the close of Elizabeth's long reign. During her reign the splendor of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham, and Throgmorten.

Elizabeth

Eliz′abethan Architecture, a style of architecture which prevailed in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan is a mixture of inferior Gothic and debased Italian, producing a singular heterogeneousness in detail, with, however, wonderful picturesqueness in general effect, and domestic accommodation more in accordance with the wants of an advancing civilization than was afforded by the styles which preceded it. The chief characteristics of Elizabethan architecture are: windows of great size both in the plane of the wall and deeply embayed, ceilings very richly decorated in relief, galleries of great length, very tall and highly-decorated chimneys, as well as a profuse use of ornamental strap work in the parapets, window heads, etc.

Elizabeth Islands, a group of sixteen American islands south of Cape Cod, with a permanent pop. of about 100.

Elizabeth Petrovna, empress of Russia (1709–1762), daughter of Peter the Great and Catharine, ascended the throne in 1741, as the result of a conspiracy, in which Ivan VI, a minor, was deposed. She was a patron of literature, founded the University of Moscow, and corresponded with Voltaire.

Elizabeth, Union co., N. J., on Staten Island Sound, 5 mi. s.e. of Newark. Railroads: Pennsylvania, Central New Jersey, Lehigh Valley, and B. & O. Industries: Sewing machine, several iron foundries, car works, copper works, wire works, two shipyards, fertilizing and oil works. Surrounding country agricultural. It is the site of one of the battles of the Revolutionary War (1780), and was the point of exchange of prisoners during that period. The town was first settled in 1609 by Dutch and English in the employ of East India Co., and became a city in 1866. Pop. 1900, 52,130.

Elizabeth Stuart, queen of Bohemia (1596–1662), daughter of James I of England and VI of Scotland. By her daughters, Elizabeth, Charlotte, and Sophia, she was the ancestress of Louis Philippe and of George I, and her sons, Rupert and Maurice, became famous Cavalier leaders.

Elizabeth, queen of Roumania, was b. in Germany, Dec. 29, 1843. She married King (then prince) Charles of Roumania.

Elk (Moose, or Moose Deer), the largest of the deer family, a native of Northern Europe, Asia, and America. The elk or moose has a short compact body, standing about 6 ft. in height at the shoulders, a thick neck, large clumsy head, and horns which flatten out almost from the base into a broad palmate form with numerous snags. In color the elk is grayish brown, the limbs, sides of head, and coarse mane being, however, of a lighter hue. Their flesh resembles beef rather than venison. For the most they are inoffensive, and so exceedingly wary that they are approached only with difficulty. The Indians and half-breeds are the most skillful moose hunters. The moose has a wide range in Canada, extending from the Arctic Ocean and British Columbia to New Brunswick and Nova Scotia; and it is found also in Maine. It feeds largely on the shoots of trees or shrubs, such as the willow and maple, and on bark, etc.

Head of Elk.

Elk, Irish, a large deer found in the Pleistocene strata, and distinguished by its enormous antlers, the tips of which are sometimes 11 ft. apart. Though a true deer, its antlers differ from those of living species in that the beam is flattened into a palm. To sustain the great weight, unusually large and strong limbs and neck vertebræ were required. Its remains are found not only in Ireland, but in Scotland and England, and on the Continent, where they occur in lacustrine deposits, brick clay, and ossiferous caves.

Elkhart, Elkhart co., Ind., on St. Joseph and Elkhart rivers, 100 mi. e. of Chicago. Railroads: Big Four, Elkhart & Western, L. S. & M. S. Industries: three flouring mills, iron foundry, paper, brass novelty, band instrument factories, and carriage and harness manufacturing. The surrounding country is agricultural. Elkhart was first settled in 1831, and became a city in 1875. Population 1900, 15,184.

Elkins, Stephen B., secretary of war, was b. in Perry co., O., Sept. 26, 1841. In New Mexico had extensive business interests; afterward in West Virginia. Appointed secretary of war in 1891. He was elected U. S. senator in 1894 and 1900.

Ellery, William (1727–1820), b. in Newport, R. I.; was one of the signers of the Declaration of Independence. He served several years in the Continental Congress, and for thirty years was collector of Newport. His son Frank rose to the rank of commodore in the navy.

Ellipse′, a figure in geometry ranking next in importance to the circle, and produced

when any cone is cut by a plane which passes through it not parallel to nor cutting the base. Kepler discovered that the paths described by the planets in their revolutions round the sun are ellipses, the sun being placed in one of the foci.

Ello′ra (or Elo′ra), a ruinous village, Hindustan, Deccan, Nizam's Dominions, 13 mi. n.w. of Aurangabad, famous for its rock and cave temples excavated in the crescent-shaped scarp of a large plateau.

Ellsworth, Ephraim E. (1837–1861), American soldier. He was commissioned colonel of a company of zouaves, which he organized, and which enlisted on the Union side at the outbreak of war in 1861. He tore down a Confederate flag from the roof of a hotel at Alexandria, and while descending from the roof was shot dead by the proprietor, Jackson, who was immediately killed by a soldier.

Ellsworth, Oliver (1745–1807), American statesman, b. in Conn. He distinguished himself in state affairs and in the Continental Congress, and was a member of the convention which drafted the Constitution of the U. S. In 1789 he was elected U. S. senator from Connecticut and was chairman of the committee which organized the federal judicial system. He was chief justice of the U. S. supreme court (1796–1799), and, later, together with Patrick Henry and Governor Davie, negotiated a treaty with France. He became prominent in state affairs and in the Continental Congress, and was a member of the federal convention of 1787 which prepared the Constitution of the U. S. It was on his motion that the words "National government" in that organic act were replaced by the definition "Government of the United States."

Ellwood, Thomas (1639–1713), an early writer among the Quakers. About 1660 he was induced to join the Society of Friends, and soon after published a book entitled *An Alarm to the Priests.* He was imprisoned on account of his religion, but subsequently became reader to Milton, and is said to have suggested to him the idea of writing the *Paradise Regained.* In 1705 and 1709 he published the two parts of his *Sacred History.* His works include a poetical life of King David, the *Davideis.*

Ellsworth, Hancock co., Me., on Union River, 26 mi. s.e. of Bangor. Railroad: Maine Central. Industries: shoe factory, iron foundry, woolen mill, lumber mills, and ship yards. Surrounding country agricultural and granite. The town was first settled in 1763 and became a city in 1868 or 1869. Pop. 1900, 4,297.

Elm, a genus of trees, consisting of thirteen species, all natives of the northern temperate zone. They have bisexual flowers with a campanulate calyx, as many stamens as there are divisions in the limb of the calyx, and two styles. The common elm is a fine tree, of rapid and erect growth, and yielding a tall stem, remarkable for the uniformity of its diameter throughout. It is very common as a timber tree in England; but as it rarely produces seed it is questionable whether it is in-

digenous. It is a native of the south and middle of Europe, and the west of Asia. The average height of a mature tree is 70 or 80 ft., but some reach 150 ft. The wood is brown, hard, of fine grain, not apt to crack, and is used for many purposes. The tree generally attains maturity in 70 or 80 years. The mountain elm, a native of Scotland, grows to a less height than the English elm, is of slower growth, and yields a much shorter bole, but it is far bolder in its ramification and more hardy. It usually attains to the height of about 50 ft. It does not produce suckers, like the English elm, but yields seed freely. The timber is strong and elastic, and the tree often yields large protuberances of gnarled wood, finely knotted and veined, and much esteemed for veneering. The smooth-leaved elm first appeared about the middle of last century. The most ornamental tree of the genus is the weeping elm. The American or white elm is abundant in the Western states, attaining its

Common Elm. *a.*—flower; *b.*—fruit.

loftiest stature between lat. 42° and 46°; here it reaches the height of 100 ft., with a trunk 4 or 5 ft. in diameter, rising sometimes 60 or 70 ft. before it separates into a few primary limbs. Its wood is not much esteemed. The red or slippery elm is found over a great extent of country in Canada, Missouri, and as far south as lat. 31°; it attains the height of 50 or 60 ft., with a trunk 15 or 20 in. in diameter; the wood is of better quality than that of the white elm. The leaves and bark yield an abundant mucilage. The wahoo, inhabiting from lat. 37° to Florida, Louisiana, and Arkansas, is a small tree, 30 ft. high. The branches are furnished on two opposite sides with wings of cork 2 or 3 lines wide; the wood is fine-grained and heavy.

Elmira, Chemung co., N. Y., on Chemung River, 275 mi. w. of New York, and 150 mi. e. of Buffalo. Railroads: Erie; Delaware, Lackawanna & Western; and Lehigh Valley & Northern Central (Pa.). Industries: bicycle factory, boots and shoes, bridge works, glass

works, and numerous others. Surrounding country agricultural. Elmira is the birthplace of Senator David B. Hill. The town was first settled about 1790, and became a city in 1864. Pop. 1900, 35,672.

Elmo's Fire, St., a meteoric appearance often seen playing about the masts and rigging of ships. If two flames are visible (Castor and Pollux) the sailors consider it a good omen; if only one (Helena), they regard it as a bad one.

El Paso, El Paso co., Tex., on Rio Grande River, 300 mi. w. of Dallas. Surrounding country agricultural and mineral. Railroads: G. H. & S. A.; A. T. & S. F.; Mexican Central; R. G. S. M. & P.; Southern Pacific; and Texas Pacific. Industries: large smelting furnaces, cigar factories, brick, tile, shingle and mattress factories. The town was first settled in 1850 and became a city in 1889. Pop. 1900, 15,906.

Ely, Richard Theodore, political economist, b. in 1854 at Ripley, N. Y. He was educated at Dartmouth and Columbia colleges, and at the University of Heidelberg, Germany. From 1885 to 1892, he was professor of political economy at Johns Hopkins University. Later he filled the same chair in the University of Wisconsin, a position which he continues to hold. His writings are condemned by some on account of their socialistic tendencies. This criticism, however, was not considered just by the board of regents of the university, and he was officially exonerated from the accusation. Among his more important works are: *French and German Socialism in Modern Times; Recent American Socialism; The Labor Movement in America; Cooperation in America; Problems of To-day;* and *Outlines of Economics.*

Ely, Isle of, a district in England, in the county of Cambridge, separated on the south by the Ouse from the remaining portion of the county. It is about 28 mi. long by 25 mi. broad; area 227,326 acres.

Elyria, Lorain co., O., 25 mi. w. of Cleveland. Railroads: Lake Shore and Michigan Southern. Manufactures: grindstones and tobacco. Pop. 1900, 8,791.

Elys'ium (Elysian Fields), among the Greeks and Romans the regions inhabitated by the blessed after death. They are placed by Homer at the extremities of the earth, by Plato at the antipodes, and by others in the Fortunate Islands (the Canaries). They were at last transferred to the interior of the earth, which is Vergil's notion.

El'zevir (or Elzevier), the name of a family of publishers and printers, residing at Amsterdam and Leyden, celebrated for the beauty of the editions of various works published by them, principally from 1595 to 1680.

Emanation, in a specific sense, an idea at the center of many philosophic systems which seek to explain the universe as an eternal efflux or emanation from the Supreme Being, comparable with the efflux of light from the sun. Traces of the doctrine are found in the system of Zoroaster. It had a powerful influence on the ancient Egyptian and Greek philosophy.

Emancipation Proclamation was issued by President Lincoln, Jan. 1, 1863, "as a fit and necessary war measure for suppressing rebellion." It freed all slaves in any states and portions of states actually in rebellion, and which were unrepresented in Congress, or not in possession of the Union armies.

Eman'uel the Great (1471–1521), king of Portugal, ascended the throne in 1495. During his reign were performed the voyages of discovery of Vasco de Gama, of Cabral, of Americus Vespucius, and the heroic exploits of Albuquerque, by whose exertions a passage was found to the East Indies, the Portugal dominion in Goa was established, the Brazils, the Moluccas, etc., were discovered. The commerce of Portugal, under Emanuel, was more prosperous than at any former period. The treasures of America flowed into Lisbon, and the reign of Emanuel was justly called "the golden age of Portugal."

Embalming (em-bäm'ing), the process of filling and surrounding with aromatic and antiseptic substances any bodies, particularly corpses, in order to preserve them from corruption. The ancient Egyptians employed the art on a great scale, and other peoples, for example the Assyrians and Persians, followed them, but by no means equaled them in it.

Egyptian Mummy.

The ancient Peruvians appear to have injected and washed the corpses with the fluid that flows from imperfectly burned wood, which would of course contain pyroligneous acid, creosote, and other antiseptics. Pliny alludes to the use of a similar fluid by the Egyptians for embalming. In later times bodies have been preserved a long time by embalming, especially when they have remained at a low and uniform temperature, and have been protected from the air. Of the various modern artificial means of preserving bodies, impregnation with corrosive sublimate appears to be one of the most effective, next to immersion in spirits. An injection of sulphate of zinc into the blood vessels is said to be very effective.

Emberiz'idæ, a family of small birds belonging to the order Insessōres and tribe Conirostres, typical genus *Emberiza.* It includes the buntings, the snow-flake, the yellow-hammer, and reed sparrow. The ortolan belongs to this family. By some naturalists they are classified as a subfamily of the finches.

Em'blements, in law, the crops actually growing at any time upon land. They are considered in law as personal property, and pass as such to the executor or administrator of the occupier, if the latter die before he has actually cut, or reaped, or gathered the same.

Embroid'ery, figured work in gold, or silver, or thread silk, wrought by the needle, upon cloths, stuffs, or muslins. In embroidering stuffs a kind of stretching-frame is used, because the more the piece is stretched the easier it is worked. The art was common in the East in very ancient times. The Jews appear to have acquired it from the Egyptians; Homer makes frequent allusion to it; and Phrygia was celebrated for its embroidery, which was in great demand at Rome. The Anglo-Saxons had a continental reputation, and from the eleventh to the sixteenth century the art of pictorial needlework was of the highest importance both as a recreation and as an industry. Embroidery is commonly divided into two classes: white embroidery applied to dress and furniture, in which the French and the Swiss excel; and embroidery in silk, gold, and silver, chiefly in demand for ecclesiastical vestments, etc. The Chinese, Hindus, Persians, and Turks excel in work of this kind.

Embryology is that division of Anatomy which treats of the growth of the fertilized ovum. The portion of life history considered under *Embryology* is limited in placental mammals to a period extending from the moment of conception to the moment in which the anatomical connection between mother and young is terminated. While the limitation seems natural enough, it is open to the following objections:—

1. In many animals, most fishes for example, there never is any anatomical union between parent and embryo, and the embryonic period must be otherwise estimated; this tendency to lead an independent existence is often carried to the point when even fertilization of the ovum takes place outside the female.

2. In other animals, such as birds and reptiles, while the ovum remains for some time after fertilization within the maternal body, it exists independently except as it profits by the maternal heat and protection. This internal incubation usually becomes shortly external, and the mother continues to warm and protect the egg until the young animal bursts open the shell and ceases to exist as an embryo.

3. Many processes, embryonic or developmental in their character, are continued after birth (e. g., formation of bone in cartilage, maturation of the genital organs, eruption of the teeth, etc.) coincidently with processes which result simply in growth, or increase in bulk or weight, so that the embryonic existence of the individual cannot be said truly to stop at birth. Furthermore, though the higher mammals cease at birth to maintain their young through a placenta, yet for a variable time thereafter the physiological union between mother and offspring continues to be nearly as intimate as before, by virtue of the helplessness of the young and the lacteal function of the mother. The student, therefore, of Philosophical Anatomy, will see in the act of parturition (childbirth) merely one epoch in the life history of an individual, which commences with the fertilization of the ovum and terminates only when the process of evolution is checked by death. To properly appreciate the manifold changes seen in watching the development of various species from ovum to adult, it must be constantly borne in mind that it is only through

such changes (often startling in abruptness and radical in character; as, e. g., in the changes in the larva to the pupa and imago in certain insects, or from mysis to zooea in crustacea) that the embryo can conquer the vicissitudes of environment and attain to adult existence.

Two laws form the basis of modern Embryology: 1, Virchow's Law—*Omnis cellula e cellulo;* which affirms that all organic life (a union of organs composed of cells) originates in the cell and becomes complex through cell division and cell specialization (or physiological division of labor); 2, Von Baer's Law—the individual in developing assumes at first a generalized form common to many types, but, proceeding, becomes more and more specialized, and less and less like parallel types until finally the completed individual stands alone. Development is from the general to the special, from the homogeneous to the heterogeneous. The evolutionary hypothesis sees in successive stages of the developing embryo dim adumbrations of long extinct ancestors, otherwise unrepresented and forgotten. "Ontogeny, or the development of the individual is a recapitulation of phylogeny, or the evolution of the race." While we may not see in this doctrine of recapitulation (Haeckel) a literal statement of the unfolding of every embryo, it is certain that at successive stages of embryonal life the human foetus (for example) assumes conditions and forms bearing strong resemblances to the embryo or adults of lower forms of life. In this connection also it is proper to refer to the rival theories of Evolution and Epigenesis; the former doctrine originated in its crudest form by the ancients, and in our time revived with great subtilety by Weissmann, holding that the embryo exists preformed in the smallest ovum and requires only fecundation to cause it to unfold into the adult; the latter, first held by Wolff, and now most generally adopted, contending that the growth of the embryo is a process of new formation, organs arising *de novo* through the stimulus upon the cell mass of conditions at present largely unknown. W. H. Allport.

Em'erald, a well-known gem of pure green color, somewhat harder than quartz. It is a silicate of aluminum and the rare element glucinum or beryllium, which was detected in it by Vauquelin after it had been discovered by the same chemist in the beryl. Its color is due to the presence of chromium. Its natural form is either rounded or that of a short six-sided prism. It is one of the softest of the precious stones, but is not acted on by acids. Emeralds of large size and at the same time free from flaws are rare; the largest on record is said to have been possessed by the inhabitants of the valley of Manta in Peru when the Spaniards first arrived there. It was as big as an ostrich egg, and was worshiped as *the mother of emeralds.* The ancients, who valued them, especially for engraving, are said to have procured them from Ethiopia and Egypt. The finest are now obtained from Colombia. The Oriental emerald is a variety of the ruby, of a green color, and is an extremely rare gem.

Emerald Green (known also as Schweinfurth green, and by a great number of other names), a vivid, light green pigment, prepared from arseniate of copper, and used both in oil and water-color painting. It is extremely poisonous.

Em'erson, Ralph Waldo (1803–1882), poet and prose writer, b. at Boston. He graduated at Harvard in 1821, for five years taught school, and in 1829 became minister of a Unitarian church in Boston, but in 1832 resigned his charge. He spent the greater part of 1833 in Europe, where he made the acquaintance of Walter Savage Landor, Wordsworth, and Carlyle; and on his return began his career as a lecturer on various subjects, in which capacity he acted for a long series of years. In 1835 he took up his permanent residence at Concord, Mass., and in 1836 published a small volume called *Nature.* He was one of the original editors of the *Dial,* a transcendental magazine begun in 1840. Two volumes of his essays were published in 1841 and 1844, and his poems in 1846. His miscellaneous addresses had been published in England in 1844, and on visiting Great Britain in 1847 he was welcomed by a large circle of admirers. In 1850 he published *Representative Men;* in 1856, *English Traits;* in 1860, *The Conduct of Life;* in 1869, *May Day and Other Poems,* and *Society and Solitude;* in 1871, *Parnassus,* a collection of poems; in 1876, *Letters and Social Aims.* Emerson showed certain similarities with Carlyle, of whom he was a friend and correspondent. Their correspondence appeared in 1883. He also numbered among his associates Bronson Alcott, Thoreau, Ellery Channing, and Margaret Fuller. He was one of the most original and influential writers the U. S. has produced.

Em'ery, an impure variety of corundum, of blackish or bluish-gray color, chiefly found in shapeless masses and mixed with other minerals. It contains about 82 per cent. of alumina, and a small portion of iron; is very hard; is infusible, and is not attacked by acids. The best emery is brought from the Levant, chiefly from Cape Emeri in Naxos. It also occurs in Spain. It is employed in cutting and polishing precious stones; in smoothing the surface of the finer kinds of lenses preparatory to their being polished; in the polishing of marble; by cutlers, locksmiths, glaziers, and other artisans. For all these purposes it is pulverized in large iron mortars or in steel mills, and the powder, which is rough and sharp, is carefully washed and sifted into eight or ten different degrees of fineness. Emery paper and emery cloth are made by laying a thin coat of glue upon the fabric, and dusting the emery from a sieve of the required size.

Emery wheels are made of a cement in which the ground emery is contained, and the excellence of the wheel depends upon the nature of the cement. The aim is to make a cement which will wear away with the emery and not leave the cutting material below the surface of the wheel. The cement must also be strong enough to withstand the centrifugal force, and not fly to pieces when the wheel re-

volves at a high speed. The wheel must have an even texture throughout, and the same density, so that one side will not wear out before the other and thus throw the wheel out of balance. Various kinds of cement are made. For example, leather treated with acids and a strong glue, hard rubber, litharge, linseed oil, shellac, celluloid, silicate of soda, chloride of calcium, glue, and oxychloride of zinc. The emery is prepared for mixing with the cement by rolling or crushing the rock. For cutting and grindstone purposes, the emery crushed under a stamp or in a rock crusher is the best, as the corners and edges of the particles are sharper, but for polishing, the emery ground between rollers is preferred. Wooden wheels with leather glued to their rims, and emery powder glued on to the leather, are used for polishing. The wooden wheel is built up from segments glued and pinned together. Buffing wheels for polishing brass, nickel-plated surfaces, copper, gold, and silver, are made of cotton or woolen cloth cut into discs and held together by iron flanges in the center.

Emeu (Emu) (ē′mū), a large cursorial bird, formerly dispersed over the whole Australian continent, but now almost extirpated in many districts. It is allied to the cassowary, but is distinguished by the absence of a "helmet"

Common Emu.

on the top of the head. It nearly equals the ostrich in bulk, being thicker in the body, though its legs and neck are shorter. Its feet are three-toed, and its feathers, which are double, are of a dull sooty-brown color, those about the neck and head being of a hairy texture. The wings are small and useless for flight, but the bird can run with great speed, and emeu coursing as a sport is said to surpass that of the hare. The flesh of the young emeu is by some considered a delicacy. The emeu is a bird of the plain, the cassowary of the forest. It is easily tamed, and may be kept out of doors in temperate climates. It feeds on vegetable matter, fruits, roots, etc.

Emeu Wren, a small Australian bird allied to the warblers, somewhat similar to a wren, but having the tail feathers long, stiff, and thinly barbed, similar to emeu feathers.

Emigration, the departure of inhabitants from one country or state to another for the purpose of residence. The prime cause of such removal is over-population, though it is often influenced by particular and temporary incidents, such as an industrial crisis, a religious or political movement, the creation of a new colony, the desire to escape from laws regarded as oppressive or from compulsory military service. In barbarous times a tribe having exhausted the tract on which it had established itself, naturally migrated to more tempting territory. In Greece, the limited territories of the states rendered the occasional deportation of part of the inhabitants to form new colonies a necessity; while at Rome, where the land was held by a few proprietors, and the trades and professions mainly exercised by slaves, the larger part of the free population had few sources of income apart from the occupation of portions of conquered territory in Italy and elsewhere. During the Middle Ages emigration was to some extent stayed by the fact that the feudal system confined the mass of the people to the soil or within the insuperable limits of a corporation. Emigration, in its proper sense, to America, commenced with the departure of the Puritans who colonized New England; after which the Germans colonized Pennsylvania, the Dutch New York, the Swedes Delaware, the French Canada and Louisiana. Still the current of emigration was slow until 1815, when its rapid increase at first occasioned some alarm. Ultimately, however, acts forbidding emigration were either repealed or allowed to become obsolete, and toward the close of the period 1815–45 the annual emigration from Britain (only 2,081 in 1815) had risen on three occasions to fully 100,000. In 1847 it rose to over a quarter of a million, while in the five years, 1849–53, the average annual emigration was not less than 323,000. From the year 1855 the numbers diminished considerably, the annual average of the period 1855–59 being 134,304, and that of 1860–64 being only 127,779. Succeeding quinquennial periods, however, show, with the exception of the period 1875–79, a fairly steady increase, the numbers of the annual averages being: 1865–69,165,283;1870–74, 206,275; 1875–79, 124,503; 1880–84, 262,441. Of late years the higher numbers have been well maintained, the total for the year 1891 being 334,543, of whom 33,752 emigrants went to the North American colonies, 252,016 to the U. S., 19,957 to Australia and New Zealand, and 28,775 to other places. Against these numbers there must, of course, be set a large influx, every year, of immigrants from abroad, the number of these in 1891 being 151,360. Other European countries have also sent out large numbers of emigrants, especially Germany, the Scandinavian countries, and Italy; Germany being second in numbers only to the United Kingdom. The great bulk of the Germans come to the U. S. Many Italians have in recent years emigrated to the Argentine Republic.

Em′met, Robert (1780–1803), an Irish patriot, b. at Cork. He was expelled from

Trinity College, Dublin, in 1798, on the ground of exciting disaffection and rebellion, and having become an object of suspicion to the government, quitted Ireland. He returned there on the repeal of the suspension of the Habeas Corpus Act, and became a member of the Society of United Irishmen for the establishment of the independence of Ireland. In July, 1803, he was the ringleader in the rebellion in which Lord Kilwarden and others perished. He was arrested a few days afterward, tried, and executed. His fate excited special interest from his attachment to Miss Sarah Curran, daughter of the celebrated barrister.

Emotion, a term variously used by psychologists; sometimes as one of the divisions of feeling, the other being sensation; sometimes as opposed to feeling when the latter is identified with sensation; and sometimes as distinct from both sensation and feeling, when the last term is rigidly confined to the sense of pleasure or pain. In any of these uses, however, emotions are distinguished from sensations in that sensations are primary forms of consciousness arising by external excitation, are comparatively simple and immediately presentative phenomena, and are definite in character and capable of localization; while emotions are secondary or derived forms of consciousness, are complex and representative, and are vague and diffused. Sensations are said to be "peripherally initiated," while emotions are centrally initiated. When, in addition to its being distinguished from sensation, it is also distinguished from feeling, emotion is applied to the whole psychical condition accompanying the sense of pleasure or pain (feeling). The muscles of the body and the organic functions of the system are often considerably influenced by emotion, which naturally seeks an outward expression unless held in check by what Darwin has called serviceable associated habits.

Emped'ocles (-klēz) (B. C. 460–400), a Greek philosopher of Agrigentum, in Sicily. He is said to have introduced the democratic form of government in his native city, and the Agrigentines regarded him with the highest veneration as public benefactor, poet, orator, physician, prophet, and magician.

Emporia, Lyon co., Kan., on Neosha River, 120 mi. s.w. of Kansas City. Railroads: Santa Fé, and two branches of M. K. & T. Industries: two flouring mills, iron foundry, creamery, cigar and canned goods factories. Surrounding country agricultural. The State Normal School is located here, also Emporia College (Presbyterian). The town was first settled in 1857 and became a city in 1872. Pop. 1900, 8,223.

Emul'sion, a medical preparation, consisting of an oily or resinous substance made to combine with water by some substance that itself has the property of combining with both, such as gum arabic, the yolk of eggs, almonds, etc.

E'mys, a genus of tortoises, type of the family Emydidæ which includes the terrapins of America and others.

Enam'el, a vitreous glaze of various colors

fused to the surface of gold, silver, copper, and other substances. The art of enameling, which is of great antiquity, was practised by the Assyrians and by the Egyptians, from whom it may have passed into Greece, and thence into Rome and its provinces, where various Roman antiquities with enameled ornamentation have been discovered. The Byzantines of the tenth century produced excellent *cloisonné* enamels on a gold base, the *cloisonné* process consisting in tracing the design in fillets of gold upon the gold plate and filling up the small molds thus formed with enamels, the design appearing in colored enamels separated by thin gold partitions or *cloisons.* In some cases, however, the enamels were filled into hollows beaten out in the gold plate, which formed part of the field. In the twelfth century the town of Limoges acquired the high reputation for inlaid enamels which it held till the fourteenth century, and reacquired in the sixteenth for its painted enamels. The costliness of the sculptured ground had led the Italians early in the fourteenth century to substitute the practise of incising the design on the face of the plate, and then covering it with a transparent enamel. The further step, which made the Limousin workshops famous, consisted in the method of superficial enameling, in which opaque colors or colors laid on a white opaque ground were used. The Limoges school degenerated greatly in the seventeenth century, but its method with certain modifications in detail is still employed. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is rendered either semitransparent or opaque by the admixture of metallic oxides. White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese or phosphate of calcium to increase the brilliancy of the color. The addition of the oxide of lead, or antimony, or oxide of silver, produces a yellow enamel. Reds are formed by copper, and by an intermixture of the oxides of gold and iron. Greens, violets, and blues are formed from the oxides of copper, cobalt, and iron. In the middle of the last century enameling was largely applied to the decoration of snuff boxes, tea canisters, candlesticks, and other small articles. Of late years it has been extensively applied to the coating of iron vessels for domestic purposes, the protection of the insides of baths, cisterns, and boilers, and the like. Enameling in colors upon iron is now common, iron plates being thus treated by means of various mixtures, and words and designs of various kinds being permanently fixed upon them by stenciling, for advertising, signboards, etc.

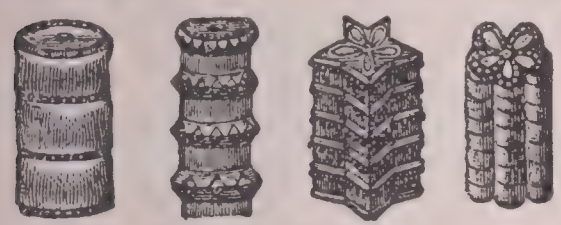
Encar'pus, in architecture, a sculptured ornament in imitation of a garland of fruits, leaves, or flowers, suspended between two points. The garland is of greatest size in the middle, and diminishes gradually to the points of suspension, from which the ends generally hang down. The encarpus is sometimes composed of an imitation of drapery similarly disposed, and sometimes of an as-

semblage of musical instruments, implements of war or of the chase.

Encaustic Painting, a kind of painting practised by the ancients, for the perfecting of which heating or burning in was required. Pliny distinguishes three species, in all of which wax was used along with colors. The art has been revived in modern times, but has not been greatly employed.

Encaustic Tiles, ornamental paving tiles of baked pottery, much used during the Middle Ages in the pavements of churches and other ecclesiastical edifices. The encaustic tile, strictly so called, was decorated with patterns formed by different colored clays inlaid in the tile and fired with it. The art appears to have originated in the latter part of the twelfth century, to have attained its highest perfection during the thirteenth, and to have sunk into disuse in the fifteenth.

Encke (en'ke), JOHANN FRANZ (1791–1865), German astronomer, b. at Hamburg. He became assistant in the observatory of Seeberg, near Gotha. Here he calculated the orbit of the comet observed by Mechain, Miss Herschel, and Pons, predicted its return, and detected a gradual acceleration of movement, ascribed by him to the presence of a resisting medium. The fame of his works led to his appointment as director of the Berlin Observatory.



Encrinite Stems.
(Mountain Limestone.)

En'crinite, a name often applied to all the marine animals of the order Crinoidea or stone lilies, class Echinodermata, but more specifically restricted to the genera having rounded, smooth stems attached to the bottom, and supporting the body of the animal, which has numerous jointed arms radiating from a central disc, in which the mouth is situated.

Encyclopædia (Cyclopædia, or Cyclopedia), a systematic view of the whole extent of human knowledge or of particular departments of it, with the subjects arranged generally in alphabetic order. Varro and Pliny the Elder, among the Romans, attempted works of an encyclopædic nature, the latter in his well-known *Historia Naturalis*, or *Natural History*. Other ancient encyclopædic works were those of Stobæus and Suidas, and especially of Marcianus Capella. In the thirteenth century a work on a regular plan was compiled by the Dominican Vincent of Beauvais, in which was exhibited the whole sum of the knowledge of the Middle Ages. His work was entitled *Speculum Historiale Naturale, Doctrinale*, to which an anonymous author added, some years later, a *Speculum Morale*. Roger Bacon's *Opus Majus* also belonged to the encyclopædic class. In the seventeenth century various encyclopædic works were compiled, such as the Latin one of Johann Heinrich Alsted. In 1674 appeared the first edition of Moreri's *Le Grand Dictionnaire Historique;* in 1677 Johann Jacob Hoffmann published at Basel his *Lexicon Universale;*

and in 1697 appeared Bayle's famous *Dictionnaire Historique et Critique*, which is still of great value. The first English alphabetical encyclopædia was the *Lexicon Technicum*, published in 1704. Among the chief English works of this kind are: 1, *Ephraim Chambers's Cyclopædia*, or a *Universal Dictionary of Arts and Sciences*, published in 1728 in 2 vols. folio. 2, *The Encyclopædia Britannica*, published in Edinburgh, in nine editions — the first in 1788, the last in 1875–88 (24 vols. 4to, besides an index vol. 1889). The chief American encyclopædias are the *Encyclopædia Americana*, in 13 vols., 1829–33; the *New American Cyclopædia*, in 16 vols., 1858–63 and 1881, and *Johnson's Universal Cyclopedia*, 4 vols., 1874–77, and 8 vols., 1885. Of the French cyclopædias the most famous is the great *Dictionnaire Encyclopédique* by Diderot and D'Alembert; the *Encyclopédie Méthodique, ou par Ordre des Matières*, Paris, 1781–1832, in 201 vols. 4to, of which 47 are plates; the *Encyclopédie Moderne*, 1824–32, 26 vols.; and the large and valuable *Grand Dictionnaire Universel du XIX Siècle*, edited by Larousse, 16 vols. folio (with supplementary vols.). Numerous works of this kind have been published in Germany, the most popular being the *Conversations-Lexikon* of Brockhaus, now in its thirteenth edition; Meyers's *Konversations-Lexikon*, in its fourth edition; and that issued by Spamer, now in its second edition. The most comprehensive is the *Allgemeine Encyklopädie*, originally edited by Professors Ersch and Gruber, begun in 1818, and not yet completed. The index to the *Chinese Encyclopædia of Literature and Science*, complete in 5,040 volumes — the most stupendous literary undertaking ever projected — fills twenty substantial volumes.

Endicott, WILLIAM C., b. in Salem, Mass., Nov. 19, 1827; was a justice of the Massachusetts supreme court from 1873 to 1883, and in 1884, as the Democratic candidate, was defeated for governor. He was secretary of war under Mr. Cleveland. Died May 6, 1900.

Endless Screw, a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion in the adjustments of machines, rather than as transmitter of any great amount of power.

Endogenous Plants (en-doj'e-nus) (or Endogens), one of the large primary classes into which the vegetable kingdom is divided, so named in consequence of the new woody bundles being developed in the interior of the stem, in which there is no distinction of pith and bark. In transverse section these bundles appear scattered through the cellular matter, being more compact toward the circumference. The other organs of the plants are also characteristic. The leaves are generally parallel-veined, the flowers usually with three organs in each whorl, the seed has an embryo with one cotyledon, and the radicle issues from a sheath and is never developed into a tap-root in germination. To this class belong palms,

grasses, rushes, lilies, etc. Endogens increase in thickness only to a limited extent; hence they are not injured by twining plants as exogens are.

Endorhiza (-rī′za), in botany, a term descriptive of the radicle of the embryo of monocotyledonous plants, which is developed inside a sheath from which it issues in germination.

En′doskeleton, in anatomy, a term applied to the internal bony structure of man and other animals in contradistinction to *exoskeleton*, which is the outer and hardened covering of such animals as the crab, lobster, etc.

En′dosperm, the tissue surrounding the embryo in many seeds and which is contained with it within the testa. It contains the supply of food for the germinating embryo, and is also called albumen or perisperm.

Endym′ion, a personage of Greek mythology, according to various accounts a huntsman, a shepherd, or a king of Elis, who is said to have asked of Zeus, or to have received as a punishment, eternal sleep. Others relate that Selēnē, or Diana, conveyed him to Mount Latmos in Caria, and threw him into a perpetual sleep in order that she might enjoy his kisses whenever she pleased.

Ene′ma, any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants.

En′ergy, in physics, the power that a body or system possesses of doing work. A body may possess energy in one of two forms, viz., as *kinetic* energy, that is, the energy due to motion, and *potential* energy, that is, energy due to what may be called a position of advantage. Thus a moving mass, a bullet, for example, can do work in virtue of its motion, and the name kinetic energy is given to energy of this kind. Under this name is also included energy belonging to molecular motion, to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy, we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock, for instance; but the term also includes the energy due to electrical separation, to absorbed heat, and to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. From the investigations of Joule and others into the nature and phenomena of heat and the discovery of the equivalence of a definite quantity of mechanical energy to a definite quantity of heat, the grand principle of the *conservation of energy* was established. This asserts that the total amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. If energy of any form seems to disappear in such a case it reappears in some other form. Thus, mechanical energy may be converted into heat. Heat again may be converted into the energy of electricity in motion, or into the potential energy of chemical separation. And electrical energy, whether potential or kinetic, and the energy of chemical separation, are also convertible into heat. Connected with this principle is another which states that no known natural process is *exactly* reversible, and that if we transform mechanical energy into heat, for example, we never can pass back and obtain from the heat produced precisely the amount of mechanical energy with which we commenced. Whatever attempt is made to transform and retransform energy by an imperfect process, and no known process is perfect, *part of the energy is necessarily transformed into heat*, and is *dissipated* so as to be incapable of further useful transformation. It therefore follows, that as energy is in a constant state of transformation, there is a constant process of *degradation* of energy going on, a process by which energy constantly approaches the unavailable form of uniformly diffused heat; and *this will go on till the whole of the energy of the universe has taken this final form.*

En′field, a market town, England, county of Middlesex, 9 mi. n. by e. of London. It is the seat of the government manufactory of rifles and small arms. Pop. 31,532.

En′gadine, a beautiful valley in Switzerland, in the Grisons, on the banks of the Inn, bordering on the Tyrol, about 50 mi. long, but in some parts very narrow, divided into Upper and Lower. The pop. of the whole valley amounts to about 12,000. The cold, dry climate and mineral springs have made the valley a favorite resort for invalids.

Enghien (ån-gi-ån), Louis Antoine Henri de Bourbon, Duke of (1772–1804), b. at Chantilly. From 1796 to 1799 he commanded the vanguard of Condé's army, which was disbanded at the peace of Lunéville (1801). He was generally looked upon as the leader of the *émigrés*, and was suspected by Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. An armed force was sent to seize him in Baden in violation of all territorial rights, and he was brought to Vincennes, 1804. A mock trial was held and he was shot in the ditch outside the walls.

En′gine, a mechanical contrivance in which one or other of the natural forces is utilized for the performance of work of some kind; often distinctively a steam engine.

England, including Wales, the southern and larger portion of the island of Great Britain. Its figure is, roughly speaking, triangular, but with many windings and indentations, the coast line measuring not less than 2,765 mi. The length of the country, measured on a meridian from Berwick nearly to St. Alban's Head, is 365 mi. Its breadth, measured on a parallel of latitude, attains its maximum between St. David's Head, in South Wales, and the Naze, in Essex, where it amounts to 280 mi. The area is 58,311 sq. mi., of which 50,933 sq. mi. are in England, and 7,378 sq. mi. in Wales. This is exclusive of the Channel Islands and the Isle of Man, which together would add 302 sq. mi. more to the area. The subdivision of England into counties is said to

date from the time when the country was still under several kings, but it does not appear to have assumed a definite form till the time of Alfred the Great. The existing division was first completed in the time of Henry VIII. The capital of England and of the British Empire is London. The cities next in size are: Liverpool, Manchester, and Salford, Birmingham, Leeds, Sheffield, Bristol, Nottingham, Bradford, and Hull.

Physical Features.—The chief indentations are: on the east, the Humber, the Wash, and the Thames estuary; on the west, the Solway Firth, Morecambe Bay, Cardigan Bay, and the Bristol Channel. The most extensive stretches of flat coast are on the east, in the co. of Lincoln, and from the southern part of Suffolk to the South Foreland in Kent, and in Sussex and Hants on the south coast. The chief islands are: Holy Island, the Farne Islands, Sheppy, and Thanet on the east coast; the Isle of Wight on the south; the Scilly Isles at the southwest extremity; and Lunday Island, Anglesey, Holyhead, and Walney on the west.

The loftiest heights of England and Wales are situated at no great distance from its western shores, and consist of a succession of mountains and hills, stretching, with some interruptions, from north to south, and throwing out numerous branches on both sides, but particularly to the west, where all the culminating summits are found. The northern portion of this range has received the name of the Pennine chain. In Derbyshire The Peak rises to the height of 2,080 ft. Amid these mountains lie the celebrated English lakes, of which the most important are Windermere, Derwent Water, Coniston Lake, and Ullswater. Here also is the highest summit of Northern England, Scawfell 3,210 ft. The Pennine chain, with its appended Cumbrian range, is succeeded by one which surpasses both these in loftiness and extent, but has its great nucleus much farther to the west, where it covers the greater part of Wales, deriving from this its name, the Cumbrian range. Across the Bristol Channel from Wales is the Devonian range. Other ranges are the Cotswold Hills proceeding in a northeasterly direction from near the Mendip Hills; the Chiltern Hills taking a similar direction farther to the east; and the North and South Downs running eastward, the latter reaching the south coast near Beachy Head, the former reaching the southeast coast at Folkestone.

Large part of the surface of England consists of wide valleys and plains. Beginning in the north, the first valleys on the east side are those of the Coquet, Tyne, and Tees; on the west the beautiful valley of the Eden, which, at first hemmed in between the Cumbrian range and Pennine chain, gradually widens out into a plain of about 470 sq. mi. The most important of the northern plains is the Vale of York, which has an area of nearly 1,000 sq. mi. Properly speaking it is still the same plain which stretches, with scarcely a single interruption, across the counties of Lincoln, Suffolk, and Essex, to the mouth of the Thames,

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and to a considerable distance inland, comprising the Central Plain and the region of the Fens.

England is well supplied with rivers, many of them of great importance to industry and commerce. Most of them carry their waters to the North Sea. If we consider the drainage as a whole, four principal river basins may be distinguished, those of the Thames, Wash, and Humber belonging to the German Ocean; and the Severn belonging to the Atlantic. The basin of the Thames has its greatest length from e. to w., 130 mi., and its average breadth about 50 mi.; area 6,160 sq. mi. The basin of the Wash consists of the subordinate basins of the Great Ouse, Nen, Welland, and Witham, which all empty themselves into that estuary, and has an area computed at 5,850 sq. mi. The basin of the Severn consists of two distinct portions, that on the right bank, of an irregularly oval shape, and having for its principal tributaries the Teme and the Wye; and that on the left, of which the Upper Avon is the principal tributary stream. The area of the whole basin is 8,580 sq. mi. The next basin, that of the Humber, the largest of all, consists of the three basins of the Humber proper, the Ouse, and the Trent, and its area is 9,550 sq. mi., being about one sixth of the whole area of England and Wales. Other rivers unconnected with these systems are the Tyne, Wear, and Tees in the northeast; the Eden, Ribble, Mersey, and the Dee in the northwest.

In regard to the minerals, climate, agriculture, manufactures, etc., of England, see *Great Britain.*

Civil History.—The history of England proper begins when it ceased to be a Roman possession. On the withdrawal of the Roman forces, about the beginning of the fifth century A. D., the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbors, the Scots and Picts. In the middle of the fifth century the occasional Teutonic incursions gave place to persistent invasion with a view to settlement. These Teutonic invaders were Low German tribes from the country about the mouths of the Elbe and Weser, the three most prominent being the Angles, the Saxons, and the Jutes. Of these the Jutes were the first to form a settlement, taking possession of part of Kent, the Isle of Wight, etc.; but the larger conquests of the Saxons in the south and the Angles in the north gave to these tribes the leading place in the kingdom. The struggle continued 150 years, and at the end of that period the whole southern part of Britain with the exception of Strathclyde, Wales, and West Wales (Cornwall), was in the hands of the Teutonic tribes. This conquered territory was divided among a number of small tribes or petty chieftaincies, seven of the most conspicuous of which are often spoken of as the *Heptarchy.* Each state was, in its turn annexed to more powerful neighbors; and at length, in 827, Egbert, by his valor and superior capacity, united in his own person the sovereignty of what had formerly been

seven kingdoms, and the whole came to be called England, that is Angle-land.

While this work of conquest and intertribal strife had been in progress toward the establishment of a united kingdom, certain important changes had occurred. The conquest had been the slow expulsion of a Christian race by a purely heathen race, and the country had returned to something of its own isolation with regard to the rest of Europe. The conversion of Kent, Essex, and East Anglia was followed by that of Northumberland and then by that of Mercia, of Wessex, of Sussex, and lastly of Wight, the contest between the two religions being at its height in the seventh century. The legal and political changes immediately consequent upon the adoption of Christianity were not great, but there resulted a more intimate relation with Europe and the older civilizations, the introduction of new learning and culture, the formation of a written literature, and the fusion of the tribes and petty kingdoms into a closer and more lasting unity than that which could have been otherwise secured.

The kingdom, however, was still kept in a state of disturbance by the attacks of the Danes, who had made repeated incursions during the whole of the Saxon period, and about half a century after the unification of the kingdom became for the moment masters of nearly the whole of England. But the genius of Alfred the Great, who had ascended the throne in 871, speedily reversed matters by the defeat of the Danes at Ethandune (878). The two immediate successors of Alfred, Edward (901–925), and Athelstan (925–940), the son and the grandson of Alfred, both vigorous and able rulers, had each in turn to direct his arms against these settlers of the Danelagh. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar, and Edward the Martyr, are chiefly remarkable on account of the conspicuous place occupied in them by Dunstan, who was counsellor to Edmund, minister of Edred, treasurer under Edwy, and supreme during the reigns of Edgar and his successor. During the tenth century many changes had taken place in the Teutonic constitution. Feudalism was already taking root; the king's authority had increased; the folkland was being taken over as the king's personal property; the nobles by birth, or ealdermen, were becoming of less importance in administration than the nobility of thegns, the officers of the king's court. Animosities between the English and the Danes became daily more violent, and a general massacre of the latter took place in 1002. The following year Sweyn invaded the kingdom with a powerful army and assumed the crown of England. Ethelred was compelled to take refuge in Normandy; and though he afterward returned, he found in Canute an adversary no less formidable than Sweyn. Ethelred left his kingdom in 1016 to his son Edmund, who displayed great valor, but was compelled to divide his kingdom with Canute; and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut), who espoused the widow of Ethelred, that he might reconcile his new subjects, obtained the name of Great, not only on account of his personal qualities, but from the extent of his dominions, being master of Denmark and Norway as well as England. In 1035 he died, and in England was followed by two other Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the English line was again restored in the person of Edward the Confessor. On Edward's death in 1066 Harold, son of Earl Godwin, obtained the crown. He found, however, a formidable opponent in the second cousin of Edward, William of Normandy, who instigated the Danes to invade the northern counties, while he, with 60,000 men, landed in the South. Harold vanquished the Danes, and hastening southward met the Normans near Hastings, at Senlac, afterward called Battle. Harold and his brothers fell (Oct. 14, 1066), and William (1066–87) immediately claimed the government as lawful king of England, being subsequently known as William I, the Conqueror. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him, he bestowed the chief offices of government upon Normans, and divided among them a great part of the country. The revolts of the native English which followed were quickly crushed.

At his death, in 1087, William II, commonly known by the name of Rufus, the conqueror's second son, obtained the crown, Robert, the eldest son, receiving the duchy of Normandy. In 1100, when William II was accidentally killed in the New Forest, Robert was again cheated of his throne by his younger brother Henry (Henry I), who in 1106 even wrested from him the duchy of Normandy. His reign was also marked by the suppression of the greater Norman nobles in England, whose power (like that of many continental feudatories) threatened to overshadow that of the king, and by the substitution of a class of lesser nobles. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry I his daughter Maud, or Matilda, wife of Geoffrey Plantagenet, Count of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V, emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed an amicable arrangement was brought about, by which it was agreed that Stephen should continue to reign during the remainder of his life, but that he should be succeeded by Henry, son of Matilda and the Count of Anjou. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II, being the first of the Plantagenet or Angevin kings. He was also in the possession of Anjou, Normandy, and Aquitaine.

Henry II found difficulty in abridging the

exorbitant privileges of the clergy, who claimed exemption not only from the taxes of the state, but also from its penal enactments, and who were supported in their demands by the primate Becket. The king's wishes were formulated in the Constitutions of Clarendon (1164), which were at first accepted and then repudiated by the primate. The assassination of Becket, however, placed the king at a disadvantage in the struggle, and after his conquest of Ireland (1171) he submitted to the church, and did penance at Becket's tomb. To curb the power of the nobles he granted charters to towns, freeing them from all subjection to any but himself, thus laying the foundation of a new order in society.

Richard I, called Cœur de Lion, who in 1189 succeeded to his father, Henry II, spent most of his reign away from England. Returning homeward from Palestine in disguise through Germany, he was made prisoner by Leopold, duke of Austria, but was ransomed by his subjects. In the meantime John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude Richard from his right. Richard's presence for a time restored matters to some appearance of order; but having undertaken an expedition against France, he received a mortal wound at the siege of Chalons, in 1199.

John was at once recognized as king of England, and secured possession of Normandy; but Anjou, Maine, and Touraine acknowledged the claim of Arthur, son of Geoffrey, second son of Henry II. On the death of Arthur, while in John's power, these four French provinces were at once lost to England. John's opposition to the pope in electing a successor to the see of Canterbury in 1205 led to the kingdom being placed under an interdict; and the nation being in a disturbed condition, he was at last compelled to receive Stephen Langton as archbishop, and to accept his kingdom as a fief of the papacy (1213). His exactions and misgovernment had equally embroiled him with the nobles. In 1213 they refused to follow him to France, and on his return defeated, they at once took measures to secure their own privileges and abridge the prerogatives of the crown. King and barons met at Runnymede, and on June 15, 1215, the Great Charter (Magna Charta) was signed. It was speedily declared null and void by the pope, and war broke out between John and the barons, who were aided by the French king. In 1216, however, John died, and his turbulent reign was succeeded by the almost equally turbulent reign of Henry III.

During the first years of the reign of Henry III the abilities of the Earl of Pembroke, who was regent until 1219, retained the kingdom in tranquillity; but when, in 1227, Henry assumed the reins of government he showed himself incapable of managing them. The struggle long maintained in the great council (henceforward called Parliament) over money grants and other grievances reached an acute stage 1263, when civil war broke out. Simon de Montfort who had laid the foundations of

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the House of Commons by summoning representatives of the shire communities to the Mad Parliament of 1258, had by this time engrossed the sole power. He defeated the king and his son Edward at Lewes in 1264, and in his famous Parliament of 1265 still further widened the privileges of the people by summoning to it burgesses as well as knights of the shire. The escape of Prince Edward, however, was followed by the battle of Evesham (1265), at which Earl Simon was defeated and slain, and the rest of the reign was undisturbed.

On the death of Henry III, in 1272, Edward I succeeded without opposition. In 1292 Balliol, whom Edward had decided to be rightful heir to the Scottish throne, did homage for the fief to the English king; but when, in 1294, war broke out with France, Scotland also declared war. The Scots were defeated at Dunbar (1296), and the country placed under an English regent: but the revolt under Wallace (1297) was followed by that of Bruce (1306), and the Scots remained unsubdued. The reign of Edward was distinguished by many legal and legislative reforms, such as the separation of the old king's court into the Court of Exchequer, Court of King's Bench, and Court of Common Pleas, the passage of the Statute of Mortmain, etc. Two years later the imposition of taxation without consent of Parliament was forbidden by a special act. The great aim of Edward, however, to include England, Scotland, and Wales in one kingdom proved a failure, and he died in 1307, marching against Robert Bruce.

The reign of his son Edward II was unfortunate to himself and to his kingdom. He made a feeble attempt to carry out his father's last and earnest request to prosecute the war with Scotland, but the English were almost constantly unfortunate; and at length, at Bannockburn (1314), they received a defeat from Robert Bruce which ensured the independence of Scotland. The king soon proved incapable of regulating the lawless conduct of his barons; and his wife, a woman of bold, intriguing disposition, joined in the confederacy against him, which resulted in his imprisonment and death in 1327.

The reign of Edward III was as brilliant as that of his father had been the reverse. The main projects of the third Edward were directed against France, the crown of which he claimed in 1328 in virtue of his mother, the daughter of King Philip. The victory won by the Black Prince at Crécy (1346), the capture of Calais (1347), and the victory of Poitiers (1356) ultimately led to the Peace of Brétigny in 1360, by which Edward III received all the west of France on condition of renouncing his claim to the French throne. Before the close of his reign, however, these advantages were all lost again, save a few principal towns on the coast.

Edward III was succeeded in 1377 by his grandson Richard II, son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that

they had acquired just notions of government. In 1380 an unjust and oppressive poll tax brought their grievances to a head, and 100,000 men, under Wat Tyler, marched toward London (1381). Wat Tyler was killed while conferring with the king, and the prudence and courage of Richard appeased the insurgents. Despite his conduct on this occasion Richard was deficient in the vigor necessary to curb the lawlessness of the nobles. In 1398 he banished his cousin, Henry Bolingbroke; and on the death of the latter's father, the Duke of Lancaster, unjustly appropriated his cousin's patrimony. To avenge the injustice Bolingbroke landed in England during the king's absence in Ireland, and at the head of 60,000 malcontents compelled Richard to surrender. He was confined in the Tower, and despite the superior claims of Edmund Mortimer, Earl of March, Henry was appointed king (1399), the first of the house of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV, acquired the crown rendered his reign extremely turbulent, but the vigor of his administration quelled every insurrection. The most important—that of the Percies of Northumberland, Owen Glendower, and Douglas of Scotland—was crushed by the battle of Shrewsbury (1403). During the reign of Henry IV the clergy of England first began the practise of burning heretics under the act *de hæretico comburendo*, passed in the second year of his reign. The act was chiefly directed against the Lollards, as the followers of Wickliffe now came to be called. Henry d. in 1413, leaving his crown to his son, Henry V, who revived the claim of Edward III to the throne of France in 1415, and invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; the victory of Agincourt was gained in 1415; and after a second campaign a peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, daughter of Charles VI, was appointed regent of France during the reign of his father-in-law, and declared heir to the throne on his death. The two kings, however, d. within a few weeks of each other in 1422, and the infant son of Henry thus became king of England (as Henry VI) and France at the age of nine months.

England during the reign of Henry VI was subjected, in the first place, to all the confusion incident to a long minority, and afterward to all the misery of a civil war. Henry allowed himself to be managed by any one who had the courage to assume the conduct of his affairs, and the influence of his wife, Margaret of Anjou, a woman of uncommon capacity, was of no advantage either to himself or the realm. In France (1422–53) the English forces lost ground, and were finally expelled by the celebrated Joan of Arc, Calais alone being retained. The rebellion of Jack Cade in 1450 was suppressed, only to be succeeded by more serious trouble. In that year Richard, duke

of York, the father of Edward, afterward Edward IV, began to advance his pretensions to the throne, which had been so long usurped by the house of Lancaster. His claim was founded on his descent from the third son of Edward III, Lionel, duke of Clarence, who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, duke of Lancaster, the fourth son of Edward III. Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The wars which resulted, called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster and a white one that of the house of York, lasted for thirty years, from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, Aug. 22, 1485. Henry VI was twice driven from the throne (in 1461 and 1471) by Edward of York, whose father had previously been killed in battle in 1460. Edward of York reigned as Edward IV from 1461 till his death in 1483, with a brief interval in 1471; and was succeeded by two other sovereigns of the house of York, first his son Edward V, who reigned for eleven weeks in 1483; and then by his brother Richard III, who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the House of Lancaster, who then became Henry VII.

Henry VII was at this time the representative of the house of Lancaster, and in order at once to strengthen his own title, and to put an end to the rivalry between the houses of York and Lancaster, he married in 1486 Elizabeth, the sister of Edward V and heiress of the house of York. The king's worst fault was the avarice which led him to employ in schemes of extortion such instruments as Empson and Dudley. He d. in 1509.

The authority of the English crown, which had been so much extended by Henry VII, was by his son Henry VIII exerted in a tyrannical and capricious manner. The most important event of the reign was undoubtedly the Reformation; though it had its origin rather in Henry's caprice and in the casual situation of his private affairs than in his conviction of the necessity of a reformation in religion, or in the solidity of reasoning employed by the reformers. Henry had been espoused to Catharine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became disgusted with his queen, and enamored of one of her maids of honor, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; but failing in his desires he broke away entirely from the Holy See, and in 1534 got himself recognized by act of Parliament as the head of the English Church. He d. in 1547. He was married six times, and left three children, each of whom reigned in turn, These were: Mary, by his first wife, Catharine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour.

Edward, who reigned first with the title of Edward VI, was nine years of age at the time of his succession, and d. in 1553 when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterward Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers, who acquired a great part of the power formerly engrossed by the Catholics. The intrigues of Dudley, duke of Northumberland, during the reign of Edward, caused Lady Jane Grey to be declared his successor; but her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII, was placed upon the throne, and Lady Jane Grey and her husband were both executed. Mary, a bigoted Catholic, seems to have wished for the crown only for the purpose of re-establishing the Roman Catholic faith. Political motives had induced Philip of Spain to accept of her as a spouse; but she could never prevail on her subjects to allow him any share of power. She d. in 1558.

Elizabeth, who succeeded her sister Mary, was attached to the Protestant faith, and found little difficulty in establishing it in England. Having concluded peace with France (1559), Elizabeth set herself to promote the confusion which prevailed in Scotland to which her cousin Mary had returned from France as queen in 1561. In this she was so far successful that Mary placed herself in her power (1568), and after many years' imprisonment was sent to the scaffold (1587). As the most powerful Protestant nation, and as a rival to Spain in the New World, it was natural that England should become involved in difficulties with that country. The dispersion of the Armada by the English fleet under Howard, Drake, and Hawkins was the most brilliant event of a struggle which abounded in minor feats of valor. In Elizabeth's reign London became the center of the world's trade, the extension of British commercial enterprise being coincident with the ruin of Antwerp in 1585. In literature not less than in politics and in commerce the same full life displayed itself, and England began definitely to assume the characteristics which distinguish her from the other European nations of to-day.

To Elizabeth succeeded (in 1603) James VI of Scotland and I of England, son of Mary Queen of Scots and Darnley. His accession to the crown of England in addition to that of Scotland did much to unite the two nations, though a certain smouldering animosity still lingered. His dissimulation, however, ended in his satisfying neither of the contending ecclesiastical parties—the Puritans or the Catholics; and his absurd insistence on his divine right made his reign a continuous struggle between the prerogative of the crown and the freedom of the people. His extravagance kept him in constant disputes with the Parliament, who would not grant him the sums he demanded, and compelled him to resort to monopolies, loans, benevolences, and other illegal methods. The nation at large, however, continued to prosper through the whole of this inglorious reign. His son Charles I who succeeded him in 1625, inherited the same exalted ideas of royal prerogative, and his marriage with a Catholic, his arbitrary rule, and illegal methods of raising money, provoked bitter hostility. Under the guidance of Laud and Stafford things went from bad to worse. Civil war broke out in 1642 between the king's party and that of the Parliament, and the latter proving victorious, in 1649 the king was beheaded.

A commonwealth or republican government was now established, in which the most prominent figure was Oliver Cromwell. Mutinies in the army among Fifth-monarchists and Levelers were subdued by Cromwell and Fairfax, and Cromwell in a series of masterly movements subjugated Ireland and gained the important battles of Dunbar and Worcester. At sea Blake had destroyed the Royalist fleet under Rupert, and was engaged in an honorable struggle with the Dutch under Van Tromp. But within the governing body matters had come to a deadlock. A dissolution was necessary, yet Parliament shrank from dissolving itself, and in the meantime the reform of the law, a settlement with regard to the church, and other important matters remained untouched. In April, 1653, Cromwell cut the knot by forcibly ejecting the members and putting the keys of the house in his pocket. From this time he was practically head of the government, which was vested in a council of thirteen. A parliament—the Little or Barebones Parliament—was summoned, in December of the same year. Cromwell was installed Lord Protector of the Commonwealth of England, Scotland, and Ireland. With more than the power of a king, he succeeded in dominating the confusion at home and made the country feared throughout the whole of Europe. Cromwell d. in 1658, and the brief and feeble protectorate of his son Richard followed.

There was now a widespread feeling that the country would be better under the old form of government, and Charles II, son of Charles I, was called to the throne by the Restoration of 1660. He took complete advantage of the popular reaction from the narrowness and intolerance of Puritanism, and even latterly endeavored to carry it to the extreme of establishing the Catholic religion, The abolition of the censorship of the press (1679), and the reaffirmation of the habeas corpus principle are the most praiseworthy incidents of the reign.

As Charles II left no legitimate issue, his brother, the Duke of York, succeeded him as James II (1685–88). An invasion by an illegitimate son of Charles, the Duke of Monmouth, who claimed the throne, was suppressed, and the king's arbitrary rule was supported by the wholesale butcheries of such instruments as Kirke and Jeffreys. The whole nation was prepared to welcome any deliverance, and in 1688 William of Orange, husband of James's daughter Mary, landed in Torbay. James fled to France, and a convention summoned by William settled the crown upon him, he thus

becoming William III. Annexed to this settlement was a Declaration of Rights circumscribing the royal prerogative by depriving him of the right to exercise dispensing power, or to exact money, or to maintain an army without the assent of Parliament. This placed henceforward the right of the British sovereign to the throne upon a purely statutory basis. A toleration act, passed in 1689, released dissent from many penalties. An armed opposition to William lasted for a short time in Scotland, but ceased with the fall of Viscount Dundee, the leader of James's adherents; and though the struggle was prolonged in Ireland, it was brought to a close before the end of 1691. The following year saw the origination of the national debt, the exchequer having been drained by the heavy military expenditure. A bill for triennial parliaments was passed in 1694, the year in which Queen Mary died. For a moment after her death William's popularity was in danger, but his successes at Namur and elsewhere, and the obvious exhaustion of France, once more confirmed his power. The treaty of Ryswick followed in 1697, and the death of James II in exile in 1701 removed a not unimportant source of danger. Early in the following year William also died, and by the act of settlement Anne succeeded him.

The closing act of William's reign had been the formation of the grand alliance between England, Holland, and the German Empire, and the new queen's rule opened with the brilliant successes of Marlborough at Blenheim (1704) and Ramilies (1706). Throughout the earlier part of her reign the Marlboroughs practically ruled the kingdom, the duke's wife, Sarah Jennings, being the queen's most intimate friend and adviser. In 1707 the history of England becomes the history of Great Britain, the Act of Union passed in that year binding the parliaments and realms of England and Scotland into a single and more powerful whole. See art. *Great Britain.*

English Art.— As regards *architecture* little can be said with regard to the style prevalent between the invasion of the Anglo-Saxons and the Norman Conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. The Norman style was introduced in the reign of Edward the Confessor. The Norman period proper extends from about 1090 to 1150, some of the best examples being parts of the cathedrals of Rochester, Winchester, Durham, and Canterbury. In the brief period 1160 to 1195 a marked change took place in the adoption of the pointed arch and what is known as the *Early English style.* Improved methods of construction led to the use of lighter walls and pillars instead of the heavy masses employed in the Norman style. Narrow lancet-shaped windows took the place of the round arch; bold projecting buttresses were introduced; and the roofs and spires became more lofty and more pointed, while in the interiors pointed arches rested on lofty clustered pillars. The Early English style has been regarded as lasting from 1190 to

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1270, when the *Decorated style* of Gothic began to prevail. The transition to the Decorated style was gradual, but it may be considered as lasting to 1377. Between 1360 and 1399 the Decorated style gave place to the *Perpendicular*, which prevailed from 1377 to 1547, and was an exclusively English style. Gothic architecture, though it lingered on in many districts, practically came to an end in England in the reign of Henry VIII. The *Elizabethan and Jacobean styles* which followed were transitions from the Gothic to the Italian, with which these styles were more or less freely mixed. In the reign of Charles I, Inigo Jones designed, among other buildings, Whitehall Palace and Greenwich Hospital in a purely classic style. After the great fire in London (1666) Sir Christopher Wren designed an immense number of churches and other buildings in classic style, particularly St. Paul's Cathedral. Various phases of classic or Renaissance continued to prevail during the eighteenth and the earlier part of the nineteenth century. About 1836 the Gothic revival commenced, and that style has been employed with considerable success in the churches erected in recent times. The Houses of Parliament, erected in 1840–1860 in the Tudor style, the Law Courts of Salford, St. Pancras railway station, and the Law Courts of London (opened 1822) in the Gothic served to sustain an impetus that had been given to the use of that style. At the present day Gothic is much employed for ecclesiastical and collegiate buildings, and a mild type of Renaissance for civil buildings. Of late years a style that has received the name of "Queen Anne" is much in vogue for private residences. It is very mixed, but withal highly picturesque. The most striking novelties in the nineteenth century have been induced by the extensive use of iron and glass, as exemplified in the Exhibition building of 1851, the Crystal Palace, Sydenham, and the great railway stations.

Very little is known of the state of the art of *painting* among the Anglo-Saxons; but in the ninth century Alfred the Great caused numerous MSS. to be adorned with miniatures, and about the end of the tenth century Archbishop Dunstan won reputation as a miniature painter. Under William the Conqueror and his two sons the painting of large pictures began to be studied, and Lanfranc, archbishop of Canterbury, adorned the vault of his church with paintings. Down to the eighteenth century a succession of foreign painters resided in England, of whom the chief were Mabuse, Hans Holbein, Cornelius Jansen, Vandyck, Lely, and Kneller. Of native artists few are of importance prior to William Hogarth (1697–1764). Throughout the eighteenth century English artists attained higher eminence in portrait-painting than in other departments, and it culminated in Sir Joshua Reynolds (1723–92), Thomas Gainsborough (1727–88), and Romney (1734–1802). Landscape painting was represented by Richard Wilson (1714–82), who painted classical scenes with figures from heathen mythology, and by Gainsborough already

1. Stephenson, at London, by E. H. Baily.

2. Druid, by William Theed.

3. Paul and Virginia, by W C. Marshall.

4. Count of Belfast, by P. MacDowell.

5. Prince Consort Albert, at London, by J. H. Foley.

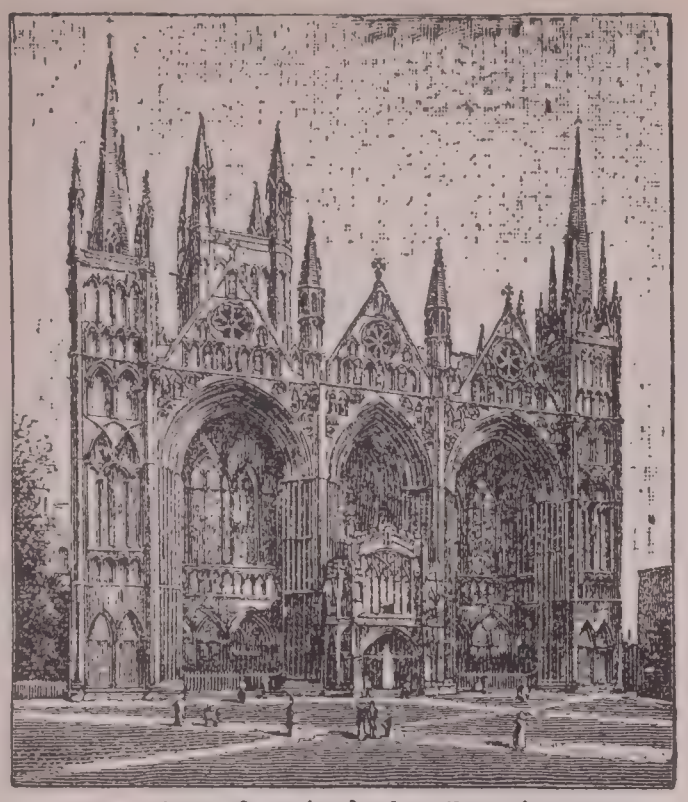
6. William Wallace, by D. W. Stevenson.

7. Carlyle, at London, by Jos. Edgar Bœhm.

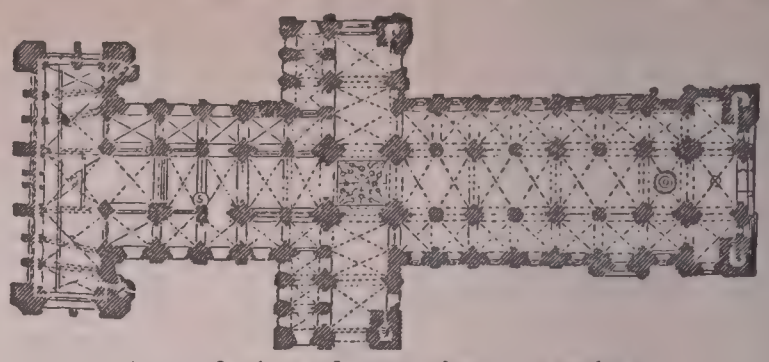
8. Venus, by John Gibson.

9. Amor and Psyche (Relief), by John Gibson.

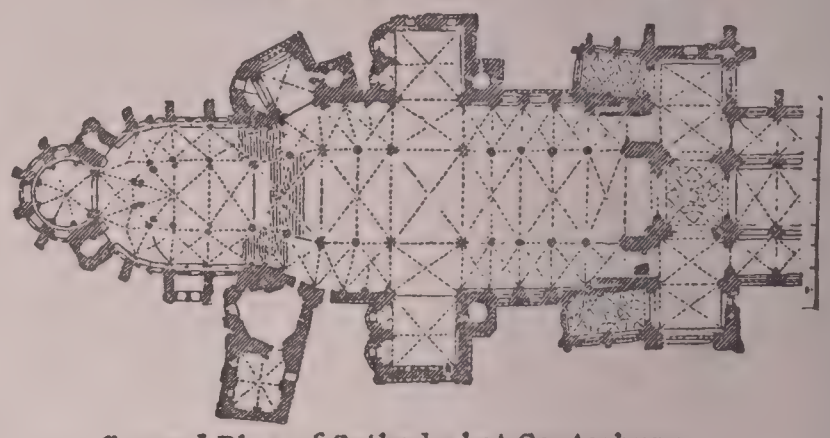
10. Peri, by James Westmacott.



West view of Cathedral at Peterborough.



2. Ground Plan of Cathedral at Durham.



3. Ground Plan of Cathedral at Canterbury.

4. Interior of Chapel in King's College.

5. Southwest view of Cathedral at Canterbury.

6. . Interior of St. Stephen's Church in London.

7. Interior of Cathedral at Rochester.

mentioned, who painted scenes of English nature and humble life. The Royal Academy of Arts, of which Reynolds was the first president, was established in London in 1769. In landscape the reputation of Turner (1775–1857) stands alone, solitary, colossal. Other distinguished landscape painters are Clarkson Stanfield (1798–1867); David Roberts (1796–1864), who greatly excelled in picturesque architecture; Wm. Müller (1812–45); and John Constable (1776–1837); whose works exercised great influence in France. In historical painting Hilton (1786–1839), Eastlake (1793–1865), Etty (1787–1849), E. M. Ward (1816–79), C. W. Cope (b. 1811), and D. Maclise (1811–70) attained celebrity. John Philip (1817–67) greatly distinguished himself by his scenes from Spanish life and by his mastery in color. Landseer (1802–73) stands by himself as a painter of animals.

In 1824 the nucleus of the National Gallery was formed by the purchase of the Angerstein collection, and in 1832 the vote was passed for the erection of the National Gallery building. The competitions held in Westminster Hall in 1843, 1844, and 1847, with a view to the decoration of the houses of Parliament, exercised great influence on art. Up to this time English pictures were rather distinguished for color and effect of light and shade than for carefulness of modeling and exactness of drawing. In aiding to bring about a more accurate and careful style of work, the Pre-Raphaelites (1840–60), while seeking to restore in their practise an early phase of Italian art, exercised a beneficial influence, while they themselves ultimately abandoned the style to which at the first they had been devoted.

The modern group of British painters may be held to date from about 1850. Prominent among these the following may be named: In historical painting Leighton, Alma-Tadema, Watts, Long, Goodall, Holman Hunt, Burne-Jones, and Madox Brown, as also W. P. Frith, whose *Derby Day* and *Railway Station* so descriptive of modern life, may well be classed as historical. In figure painting, or *genre*, T. Faed, Erskine Nicol, Fildes, Orchardson, Herkomer, and Pettie. In portraiture Millais, Frank Holl, Ouless, and Richmond. In landscape Linnell, Hook, Peter Graham, John Brett, and Keeley Halswelle. In water colors the most eminent artists have been Girtin, Cotman, Liverseege, Stothard, Turner, and David Cox.

English *sculpture* was long merely an accessory to architecture, and few English sculptors are known by name till comparatively modern times. During the Renaissance period Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII, and that of Henry himself at Westminster. After the Restoration two sculptors of some note appeared, Grinling Gibbons, a wood carver, and Caius Gabriel Cibber. John Flaxman and his rival and successor, Sir Francis Chantrey, acquired renown by the busts and statues which they made of many of the eminent men of the time. W. H. Thorneycroft, J. E. Boehm, E. Onslow Ford, C. B. Birch, and Alfred Gilbert are among the foremost sculptors of the present time.

English Language.—The language spoken in England from the settlement of the Anglo-Saxons to the Norman Conquest (say 500–1066) is popularly known as Anglo-Saxon, though simply the earliest form of English. It was a highly inflected and purely Teutonic tongue presenting several dialects. The Conquest introduced the Norman-French, and from 1066 to about 1250 two languages were spoken, the native English speaking their own language, the intruders speaking French. During this period the grammatical structure of the native language was greatly broken up, inflexions fell away, or were assimilated to each other; and toward the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by being purely Saxon or Teutonic in vocabulary. Finally, the two languages began to mingle and form one intelligible to the whole population, Normans as well as English, this change being marked by a great infusion of Norman-French words, and English proper being the result. English is thus, in its vocabulary, a composite language, deriving part of its stock of words from a Teutonic source and part from a Latin source, Norman-French being in the main merely a modified form of Latin. In its grammatical structure and general character, however, English is entirely Teutonic, and is classed with Dutch and Gothic among the Low German tongues. If we divide the history of the English language into periods we shall find three most distinctly marked: 1, the Old English or Anglo-Saxon, extending down to about 1100; 2, the Middle English, 1100–1400 (to this period belong Chaucer, Wickliffe, Langland); 3, Modern English. A more detailed subdivision would give transition periods connecting the main ones. The chief change which the language has experienced during the modern period consists in its absorbing new words from all quarters in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. At the present time the rapid growth of the sciences already existing, and the creation of new ones, have caused whole groups of words to be introduced, chiefly from the Greek.

English Literature.—Before any English literature, in the strict sense of the term, existed, four literatures had arisen in England—the Celtic, Latin, Anglo-Saxon, and Anglo-Norman. The first includes such names as those of Taliesin, Llywarch Hen, Aneurin, and Merlin or Merddhin. The Latin literature prior to the Conquest presents those of Aldhelm, Bede, Alcuin, Asser, Ethelwerd, and Nennius. With the coming of the Normans, although the *Anglo-Saxon Chronicle* was continued until 1154, the native language practically ceased for a time to be employed in literature, Latin being employed in law, history, and philosophy; French in the lighter forms of literature. The Latin literature included important contribu-

tions to the Scholastic philosophy by Alexander Hales (d. 1245), Duns Scotus (d. 1308), and William of Occam (d. 1347), the philosophic works of Roger Bacon (1214–92), the Golias poems of Walter Map, and a long list of chronicles or histories, either in prose or verse, by Eadmer (d. 1124), Ordericus Vitalis (d. 1142), William of Malmesbury (d. 1143), Geoffrey of Monmouth (d. 1154), Joseph of Exeter (d. 1195), Roger of Wendover (d. 1237), Giraldus Cambrensis (d. 1222), and Matthew Paris (d. 1259).

Apart from a few brief fragments, the first English writings after the Conquest are the *Brut of Layamon* (about 1200), based on the *Brut of Wace*. Next in importance come the rhyming chroniclers, Robert of Gloucester, and Robert of Brunne, or Mannyng (d. 1340). To this pre-Chaucerian period belong also several English translations of French romances —Horn, Tristrem, Alisaunder, Havelok, and others. Between the beginning and the middle of the fourteenth century the English speech had entered upon a new phase of development in the absorption of Norman-French words. A rapid expansion of the literature followed, having as the foremost figure that of Chaucer (1340–1400), who, writing at first under French influences, and then under Italian, became in the end the most representative English writer of the time. Contemporary with him were the poets William or Robert Langland (1332–1406), John Gower (1325–1408), John Barbour (1316–95). In prose the name of John Wickliffe (1324–84) is pre-eminent, the English version of *Mandeville's Travels* being apparently of later date.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the fourteenth to near the end of the sixteenth century, is a very barren one in English literature, in part probably owing to foreign and domestic wars, the struggle of the people toward political power, and the religious controversies preceding and attending the Reformation. The literature was chiefly polemical, the only noteworthy prose prior to that of More being that of Reginald Pecock (1390–1460), Sir John Fortescue (1395–1485), the Paston Letters (1422–1505), and Malory's *Morte d' Arthur* (completed 1469–70); the only noteworthy verse, that of John Skelton (1460–1529).

It was now that several events of European importance combined to stimulate life and enlarge the mental horizon— the invention of printing, or rather of movable types, the promulgation of the Copernican system of astronomy, the discovery of America, the Renaissance, and the Reformation. The Renaissance spread from Florence to England by means of such men as Colet, Linacre, Erasmus, and Sir Thomas More (1480–1535), the last noteworthy as at the head of a new race of historians. Important contributions to the prose of the time were the *Tyndale New Testament*, printed in 1525, and the *Coverdale Bible* (1535). The first signs of an artistic advance in poetic literature are to be found in Wyatt (1503–42) and Surrey (1516–47), who nationalized the sonnet,

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and of whom the latter is regarded as the introducer of blank verse. The drama, too, had by this time reached a fairly high stage of development. The mystery and miracle plays, after the adoption of the vernacular in the fourteenth century, passed from the hands of the clergy into those of the laity, and both stage and drama underwent a rapid secularization. The morality began to embody matters of religious and political controversy, historical characters mingled with the personification of abstract qualities, real characters from contemporary life were introduced, and at length farces on the French model were constructed, the *Interludes of John Hayward* (d. 1565) being the most important examples. To Nicholas Udall (1504–56) the first genuine comedy, *Ralph Roister Doister*, was due, this being shortly afterward followed by John Still's *Gammer Gurton's Needle*. The first tragedy, the *Ferrex and Porrex*, or *Gorboduc* of Sackville and Norton, was performed in 1561, and the first prose play, the *Supposes of Gascoigne* in 1566. Gascoigne and Sackville were in other regards than drama noteworthy among the earlier Elizabethans; but the figures which bulk most largely are those of Sidney and Spenser. In drama Lyly, Peele, Greene, Nash, and Marlowe are the chief immediate precursors of Shakespeare, Marlowe alone, however, being at all comparable with the great master. Contemporary and later dramatic writers were Ben Jonson, the second great Elizabethan dramatist, Middleton Marston, (better known as a satirist), Chapman, Thomas Heywood, Dekker, Webster, Ford, Beaumont and Fletcher, and Massinger. In Elizabethan prose the prominent names are those of Roger Ascham, Lyly the Euphuist, Hooker, Raleigh, Bacon, the founder in some regards of modern scientific method, Burton, Herbert of Cherbury, and Selden, with Overbury, Knolles, Holinshed, Stowe, Camden, Florio, and North. The issue of the authorized version of the Bible in 1611 may be said to close the prose list of the period.

After the death of James I the course of literature breaks up into three stages, the first from 1625 to 1640, in which the survivals from the Elizabethan Age slowly die away. The "metaphysical poets," Cowley, Wither, Herbert, Crashaw, Habbington, and Quarles, and the cavalier poets, Suckling, Carew, Denham, all published poems before the close of this period, in which also Milton's early poems were composed, and the *Comus* and *Lycidas* published. The second stage (1640–60) was almost wholly given up to controversial prose, the Puritan revolution checking the production of pure literature. In this controversial prose of the time Milton was easily chief. With the Restoration a third stage was begun. Milton turned his new leisure to the composition of his great poems; the drama was revived, and Davenant and Dryden, with Otway, Southerne, Etherege, Wycherley, Congreve, Vanbrugh, and Farquhar in their first plays, and minor playwrights, are the most representative writers of the period. Butler established a *genre*

in satire, and Marvell as a satirist in some respects anticipated Swift; Roscommon, Rochester, and Dorset contributed to the little poetry; while in prose we have Hobbes, Clarendon, Fuller, Sir Thomas Browne, Walton, Cotton, Pepys and Evelyn, John Bunyan, Locke, Sir William Temple, Owen Feltham, Sir Henry Wotton, James Harrington, and a crowd of theological writers, of whom the best known are Jeremy Taylor ("Spenser of prose" and "Shakespeare of divines"), Richard Baxter, Robert Barclay, William Penn, George Fox, Isaac Barrow, John Tillotson, Stillingfleet, Bishop Pearson, Sherlock, South, Sprat, Cudworth, and Burnet. Other features of the last part of the seventeenth century were the immense advance in physical science under Boyle, Isaac Newton, Harvey, and others, and the rise of the newspaper press.

Dryden's death in 1700 marks the commencement of the so-called Augustan Age in English literature. During it, however, no greater poet appeared than Pope (1688–1744), in whom sagacity, wit, and fancy take the place of the highest poetic faculty, but who was a supreme artist within the formal limits of his conception of metrical art. Against these formal limits signs of reaction are apparent in the verse of Thomson, Gray, Collins, Goldsmith, and in the productions of Macpherson and Chatterton. The poets Prior, Gay, and Ambrose Phillips inherit from the later seventeenth century, Gay being memorable in connection with English opera; and there are a large number of small but respectable poets. It is in prose that the chief development of the eighteenth century is to be found, Defoe and Swift led the way in fiction and prose satire; Steele and Addison, working on a suggestion of Defoe, established the periodical essay. Goldsmith also falls into the fictional group as well as into those of the poets and the essayists. Johnson exercised during the latter part of his life the power of a literary dictator, with Boswell as literary dependent. The other chief prose writers were Bishop Berkeley, Arbuthnot, Bolingbroke, Burke, the historians David Hume, William Robertson, Edmund Gibbon; the political writers Wilkes and Junius; the economist and moral philosopher, Adam Smith; the philosophical writers, Hume, Bentham, and Dugald Stewart; the scholars, Bentley, Sir William Jones, and Richard Porson; the theologians, Atterbury, Butler, Warburton, and Paley, and some inferior playwrights, of whom Rowe, John Home, Colley Cibber, Colman the elder, Foote, and Sheridan were the most important.

With the French Revolution, or a few years earlier, the modern movement in literature may be said to have commenced. The departure from the old traditions, traceable in Gray and Collins, was more clearly exhibited in the last years of the century in Cowper (1731–1800) and Burns (1759–96), and was developed and perfected in the hands of Blake, Bowles, and the "Lake Poets," Wordsworth, Coleridge, and Southey; but there were at first many survivals from the poetic manner of the seventeenth century, such as Erasmus Darwin, Dr. John

Wolcot, Robert Bloomfield, and Samuel Rogers. Among the earlier poets of the century, also, were George Crabbe, Sir Walter Scott, Hogg, Campbell. A more important group was that of Byron, Shelley, and Keats, with which may be associated the names of Leigh Hunt, Thomas Moore, and Landor. Among the earlier writers of fiction there were several women of note, such as Maria Edgeworth, and Jane Austen. The greatest name in fiction is unquestionably that of Scott. Other prose writers were Mackintosh, Malthus, Hallam, James Mill, Southey, Hannah More, Cobbett, William Hazlitt, Sydney Smith. In the literature since 1830 poetry has included as its chief names those of Praed, Hood, Sidney Dobell, Alexander Smith, Charles Mackay, William Allingham, Elizabeth Barrett Browning, Coventry Patmore, Lord Lytton (Owen Meredith), Arthur Hugh Clough, Matthew Arnold, Dante G. Rossetti, Robert Buchanan, Wm. Morris, Swinburne, and last and greatest, Tennyson and Browning. A brilliant list of novelists for the same period includes Lord Lytton, Ainsworth, Benjamin Disraeli (Earl of Beaconsfield), Dickens, Thackeray, Charles Kingsley, Charlotte Brontë, Wilkie Collins, George Mac Donald, Charles Reade, George Eliot, William Black, Thomas Hardy, R. D. Blackmore, George Meredith, Mrs. Craik (Miss Muloch), Mrs. Oliphant, Miss Yonge, Miss Thackeray, and others. To the historical and biographical list belong Allison, Macaulay, Carlyle, Cornwall Lewis, Milman, Froude, Lecky, Kinglake, John Richard Green, Dean Stanley, John Morley, Leslie Stephen. Prominent among the theological writers have been Dr. Newman, Whately, Augustus and Julius Hare, Maurice, Hamilton, Alford, Stopford Brooke, Liddon, Isaac Taylor, James Martineau, and Caird. In science and philosophy among the chief writers have been Sir W. Hamilton, John Stuart Mill, Alexander Bain, Hugh Miller, Charles Darwin, Huxley, Tyndall, Max Müller, Herbert Spencer, T. H. Green. Of the other prose writers of importance the chief are De Quincey, Harriet Martineau, Sir Arthur Helps, Ruskin, Matthew Arnold, W. E. Gladstone. For American Literature see *United States.*

English Channel, the arm of sea which separates England from France, extending, on the English side, from Dover to the Land's End; and on the French, from Calais to the Island of Ushant.

Engraving, the art of representing objects and depicting characters on metal, wood, precious stones, etc., by means of incisions made with instruments variously adapted to the substances operated upon and the description of work intended. Impressions from metal plates are named engravings, prints, or plates; those printed from wood being called indifferently wood engravings and woodcuts. While, however, these impressions are not altogether dissimilar in appearance, the processes are distinct. In plates the lines intended to print are incised, and in order to take an impression the plate is daubed over

with a thick ink which fills all the lines. The surface is then wiped perfectly clean, leaving only the incised lines filled with ink. A piece of damp paper is now laid on the face of the plate, and both are passed through the press, which causes the ink to pass from the plate to the paper. This operation needs to be repeated for every impression. In the wood block, on the contrary, the spaces between the lines of the drawing are cut out, leaving the lines standing up like type, the printing being from the inked surface of the raised lines, and effected much more rapidly than plate printing.

Engraving on wood, intended for printing or impressing from, long preceded engraving on metals. The art is of Eastern origin, and at least as early as the tenth century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans in the thirteenth century. For a hundred and fifty years, however, there is small indication of the practise of the art, which was at first confined to the production of block books, playing cards, and religious prints. In the fifteenth century the art of printing from engraved plates was discovered in Florence by Maso Finiguerra. Engraving had long been used as a means of decorating armor, metal vessels, etc., the engravers generally securing duplicates of their work before laying in the niello (a species of metallic enamel) by filling the lines with dark color, and taking casts of them in sulphur. The discovery of the practicability of taking impressions upon paper led to engraving upon copper plates for the purpose of printing from. The date of the earliest known niello proof upon paper is 1452. The work of the Florentine engravers, however, was almost at once surpassed in Venice and elsewhere in North Italy by Andrea Mantegna (1431–1505), Girolamo Mocetto, Giovanni Batista del Porto, and others. In Marc Antonio Raimondi (1475–1534), who wrought under the guidance of Raphael, and reproduced many of his works, the art reached its highest point of the earlier period, and Rome became the center of a new school, which included Marco da Ravenna (d. 1527), Giulio Bonasone (1531–1572), and Agostino de Musis (d. 1536). In the meantime, in Germany the progress of the art had been not less rapid. Of the oldest school the most important engraver is Martin Schongauer (1420–1488). He was, however, surpassed a generation later by Albert Durer (1471–1528), who excelled both in copper and wood engraving, especially in the latter. The Dutch and Flemish schools, of which Durer's contemporary, Lucas van Leyden was the head, did much to enlarge the scope of the art. Rubens (1577–1640) influenced engraving through the two Bolswerts, Vorstermann, Pontius and P. de Jode, who engraved many of his works on a large size. Toward the end of the seventeenth century etching, which had before been rarely used, became more common, and was practised with great success by Rembrandt

Engraving

(1607–1669) and other painters of that period. In France Noel Garnier founded a school of engraving about the middle of the sixteenth century; but it produced no work of any high distinction until the reign of Louis XIV, when Nanteuil's pupils Gerard Edelinck and Gerard Audran flourished. But these were all surpassed about the middle of the eighteenth century by Wille (1717–1807), a German resident in Paris. Before the middle of the seventeenth century England produced little noteworthy work, availing herself principally of the work of foreign engravers, of whom many took up temporary and even permanent residence. The first English engraver of marked importance was William Hogarth (1697–1764). Vivares (1712–1782), a Frenchman by birth, laid the foundation of the English school of landscape engraving, which was still further developed by William Woollet (1735–1785), who was also an excellent engraver of the human figure. The substitution of steel for copper plates (1820–1830) gave the power of producing a much larger number of fine impressions, and opened new possibilities for highly finished work. During the closing years of the eighteenth century line engraving attained a depth of color and fullness of tone in which earlier works generally are deficient, and during the present century it has reached a perfectness of finish which it had not previously attained. Among engravers who have produced historical works of large size and in the line manner the names of Raphael Morghen (1758–1833), Longhi (1766–1831), and Toschi, in Italy; of Forster (1790–1872), and Blanchard (b. 1819), in France; of John Burnet (1784–1868), J. H. Robinson (1796–1871), Geo. T. Doo (1800–1886), J. H. Watt (1799–1867), and Lumb Stocks (b. 1812), in England, stand preeminent. In the period 1820–60 landscape engraving attained a perfection in Great Britain which it had not attained in any other country, or at any other time. In the period 1830–45 various publications called *Annuals*, composed of light literature in prose and verse, and illustrated by highly finished engravings in steel, were very popular. The unrivaled illustrations of Rogers's *Poems* and Rogers's *Italy*, after Turner and Stothard, belong to this period. Many of the originals of the engravings in the *Annuals* were finished pictures of large size. A great part of the difficulty in engraving on a small scale from a large picture, consists in determining what details can be left out, and still preserve the full effect and character of the original. Since 1870 many plates have been produced by a combination of etching and dry point, a comparatively cheap and rapid process. Such works have been fashionable and very popular with collectors. But while some of them have been excellent of their kind, the process is of limited resource, and the best works in this manner will not stand comparison with the masterpieces of line engraving. In France and in Germany some able line engravers are in practise.

Line Engraving, as implied by the term, is executed entirely in lines. The tools are few

and simple. They consist of the graver, or *burin*, the point, the scraper, and the burnisher; an oil stone or hone, dividers, a parallel square, a magnifying lens; a bridge on which to rest the hand; a blind or shade of tissue paper, to make the light fall equally on the plate, callipers for leveling important erasures, a small steel anvil, a small pointed hammer, and punches. In etching, the following articles are required: a resinous mixture called etching ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a hand vice; some hair pencils of different sizes, and bordering wax, made of Burgundy-pitch, beeswax, and a little oil.

In engraving, the plate, which is highly polished and must be free from all scratches, is first prepared by spreading over it a thin layer of *ground*. The surface is then smoked, and the outline of the picture transferred to it by pressure from the paper on which it has been drawn in fine outlines by a black lead pencil. The picture is then drawn on the ground with the etching needle, which removes the ground in every form produced by it, and leaves the bright metal exposed. A bank of wax is then put round the plate and diluted acid poured on it, which eats out the metal from the lines from which the ground has been removed, but leaves the rest of the plate untouched. The plate is then gone over with the graver, the etched lines clearly defined, broken lines connected, new lines added, etc. Sometimes the plate is *rebitten* more than once, those parts which are sufficiently bitten in the first treatment being *stopped* with varnish, and only the selected parts exposed to after-biting. Finally the burnisher is brought into play alternately with the graver and point to give perfectness and finish. Such is the process for landscape engraving. In historical and portrait engraving of the highest class, the lines are first drawn on the metal with a fine point and then cut in by the graver, first making a fine line and afterward entering and re-entering till the desired width and depth of lines is attained. Much of the excellence of such engravings depends on the mode in which the lines are laid, their relative thickness, and the manner in which they cross each other. In historical engraving etching is but little used, and then only for accessories and the less important parts.

Soft-ground Etching.—The ground, made by mixing lard with common etching ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then damped, and laid gently over the ground face upward, and the margins folded over and pasted down on the back of the plate. When the paper is dry and tightly stretched the bridge is laid across, and with a hardish pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back of the paper at all parts touched by the pencil,

Engraving

and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk-drawing. The biting-in is effected in the same manner as already described, and the subject is finished by rebiting and dotting with the graver.

Stipple, or Chalk Engraving, in its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands; but few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. A great advance, however, has been made in stipple engraving by the introduction of large and varied forms of dotting in the draperies, the results almost rivaling line engraving in richness and power.

The process of *Aquatint* and *Mezzotint* will be found under their respective heads, the latter differing from all other styles of engraving in that the lights and gradations are scraped or burnished out of a dark ground that has first been wrought upon the plate, instead of the forms being corroded or cut into a plain surface.

The Mixed Style is based on mezzotinto, which, still forming the great mass of shading, is in this method combined with etching in the darker, and stipple in the more delicate parts. By this combination a plate will produce a larger number of good impressions than were it done entirely in mezzotinto.

Engraving on Wood.—Wood engravings are made on Turkish boxwood which ranges in value from one eighth of a cent to eight cents a square inch. The finer the grain the higher the price, and the fine, close-grained wood is only used for the best work. The wood is cut across the grain, and as a boxwood log is seldom over four inches in diameter, the blocks of wood are joined together. So perfect is the joining that the joints cannot be detected. A slab of boxwood is as thick as type are long. One side of the slab is polished and finished, and wherever there are imperfections in the wood, a hole is bored and a plug of wood is neatly inlaid. A block of the required size is sawed from the slab and prepared for the artist. If the artist is to draw the design or picture to be engraved on the block, the engraver scours the face of the block with pumice stone and a little water. When the wood is bright enough the water is dried off and a little flake white is rubbed over the surface. This gives a drawing surface. The artist then sketches the design and turns the block over to the engraver.

Sometimes the object which is to be reproduced by the wood engraver is photographed on the face of the block. A reverse negative is obtained, and the face of the wood is coated with gelatin and treated with a mixture of zinc white and acids. The surface is then sensitized with nitrate of silver in a "dark room." The negative is clamped to the block,

film side next to the wood, and a photographic print is made in the usual manner. The wood engraver's tools are delicate and made of the finest steel, and are called gravers. These include "tint" tools, which are used for cutting mechanical or perfectly straight parallel lines; "lozenge" tools, used for cutting artistic or curved lines; elliptical tools, gouges, etc. If a slip of the knife is made, a hole is bored in the block where the tool slipped, and a plug of wood is inserted. Before the engraver begins cutting out the design he gums a piece of paper over the sketch or photograph, he tears out a hole over that part of the work where he begins engraving. The paper keeps the hand and fingers from smudging the drawing, and as the work progresses he enlarges the hole. After the job is finished a proof is taken under a hand press, and if it is satisfactory the woodcut is sent to the electrotyper, as the printing is not done from the woodcut, but from electrotypes of it.

En'nius, QUINTUS (B.C. 239–169), an early Latin poet, considered by the Romans as the father of their literature, was b. at Rudiæ.

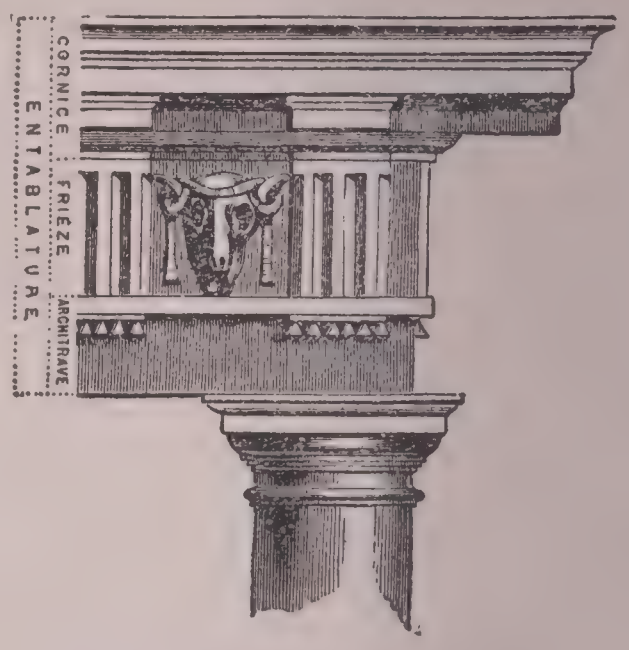
Enns, a river in Austria, which rises in the Alps of Salzburg, and enters the Danube a little below the town of Enns. Total course about 160 mi.

Enoch, Book of, an apocryphal book of an assumedly prophetical character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the fourteenth and fifteenth verses of his epistle. It is referred to by many of the early fathers; is of unknown authorship, but was probably written by a Palestinian Hebrew. Its date is also uncertain, critical conjecture ranging from 144 B.C. to 132 A.D.

Ensilage (or Silage), green forage crops preserved as near as possible in its natural condition for stock food. If properly handled it is relished by nearly all kinds of farm animals, especially by cattle. At the present time it is largely used by dairy farmers. All kinds of forage can be used for ensilage but corn is the favorite crop. An air-tight mow or silo is used for storing ensilage. It is generally made in a portion of the barn and should be very near the place of feeding. The higher the silo the better the ensilage will keep as it becomes more compact, thus better excluding the air. Some build the silo round, others octagonal, but more generally they are square with diagonal pieces perhaps six or eight inches wide, placed in the corners. The bottom should be on a cement floor. The main point in raising corn for ensilage is to get as large a crop as possible of both forage and corn. When the corn is nearly ripe enough for ordinary cutting, it is drawn to the silo and cut in proper lengths for storing, It is well distributed in the silo and thoroughly tramped, special care being taken at the sides and corners. Two days' time is sufficient for filling the average silo. If the silo is 20 or 30 ft. in height, the ensilage will settle from 5 to 7 ft., and if more ensilage is required it can be refilled after settling three or four days. One or two loads of straw is run

through the cutter and placed on top of the ensilage for covering. In the winter it is fed with little trouble. The cattle will eat it up clean. Horses and sheep also are very fond of it. A small amount of space for storing a large amount of stock food is one of the economic points in favor of ensilage. A cubic foot in the silo will weigh 40 to 50 lb.

Entab'lature, in architecture, the horizontal, continuous work which rests upon a row of columns, and belongs especially to classical architecture. It consists of three principal



Example of Doric Entablature.

divisions — the *architrave* immediately above the abacus of the column, next the *frieze*, and then the *cornice.* In large buildings projections similar to and known also as entablatures are often carried round the whole edifice, or along one front of it.

Enta'da, a genus of leguminous plants, suborder Mimoseæ, containing about a dozen species of climbing tropical shrubs, remarkable for the great size of their pods. *E. scandens* has pods which measure from 6 to 8 ft. in length. The seeds have a hard, woody, and beautifully polished shell, and are often made into snuff-boxes, scent-bottles, etc.

Entail', in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. Entailed estates are divided into *general* and *special*, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others.

Entomol'ogy, the branch of zoology which treats of the insects, the name being from Greek *entŏma*, animals "cut in," the transverse division or segmentation of the body being their most conspicuous feature. See *Insects.*

Entozo'a, a general name for those annulose parasitical animals, which infest the bodies of other animals. Some are found in the intestines, others in the liver, brain, muscles, and other tissues. They pass through different stages in their development, and at each stage occupy a different tissue and usually a different animal.

Entre Rios (en′tre rē′os) ("between rivers"), a province of the Argentine Republic, lying between the Uruguay and the Paranà: area est. at 45,000 sq. mi.; pop. 300,000. The province is largely pastoral. Capital Concepcion, with a pop. of 10,000.

En′try, in law, the act of taking possession of lands or tenements by entering or setting foot on the same.

En′velopes, the paper covers that enclose letters or notes. They became common shortly after the introduction of the penny postage system; were at first made chiefly by hand, but are now not only shaped, but folded, gummed, etc., by machinery.

E′ocene, in geology, a term applied to the lower division of the Tertiary strata, from Gr. *eos*, dawn, and *kainos*, recent, because remains of existing organic species first occur here. The Eocene beds are arranged in two groups, termed the lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene.

Eozo′ic Rocks, the name given to the oldest fossiliferous rocks, such as the Laurentian and Huronian of Canada, from their being supposed to contain the first or earliest traces of life in the stratified systems.

Ep′acris, a genus of monopetalous exogens, the typical genus of the natural order Epacridaceæ, distinguished by having a colored calyx with many bracts, a tubular corolla with smooth limb, stamens affixed to the corolla, and a five-valved, many-seeded capsule. The species are shrubby plants, with axillary, white, red, or purple flowers, generally in leafy spikes. The order Epacridaceæ consists of plants allied to the heaths, chiefly natives of Australia. The fruit of some species is eaten under the name of Australian cranberry, and they are cultivated in greenhouses for their flowers.

Ep′act, in chronology, the excess of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months. The epacts then are *annual* and *menstrual*, or *monthly*. Suppose the new moon to be on January 1: the month of January containing 31 days, and the lunar month only 29 days, 12 hours, 44 minutes, 3 seconds; the difference 1 day, 11 hours, 15 minutes, 57 seconds, is the *menstrual epact*. The *annual epact* is nearly 11 days; the solar year being 365 days, and the lunar year 354.

Epaminon′das (B. C. 418–362), an ancient Greek hero, who, for a short time, raised his country, Thebes, to the summit of power and prosperity. He took the leading part in the struggle during which Spartan supremacy in Greece was destroyed, and the supremacy of Thebes temporarily secured. Four times he successfully invaded the Peloponnesus at the head of the Thebans.

Ephem′era, the typical genus of the insect family Ephemeridæ, Neuropterous insects, so named from the extreme shortness of their lives in the perfect state. They are known as *May-flies* or *day-flies*, and are characterized by the slenderness of their bodies; the delicacy of

their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the abdomen in three filiform appendages. In the state of larvæ and pupæ they are aquatic and exist for years. When ready

Development of the May-fly.

for their final change they creep out of the water, generally toward sunset of a fine summer evening. They shed their whole skin shortly after leaving the water, propagate their species, and die, taking no food in the perfect state.

Eph′esus, an ancient Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth. It was at one time the grand emporium of Western Asia, having a convenient and spacious harbor. The first great temple, begun about B.C. 650 and finished after 120 years, was burned by the notorious Herostratus B.C. 356. A second and more magnificent was then erected, which was burned by the Goths in A.D. 262. Some interesting remains have recently been discovered by excavation. Several church councils were held here, especially the third ecumenical council of 431, at which Nestorius was condemned. The site of the city is now desolate; near it is a poor village, Aiasoluk.

E′phraim, the younger son of Joseph, and the founder of one of the twelve tribes of Israel.

Ep′ic, a poem of the narrative kind. Some authorities restrict the term to narrative poems written in a lofty style and describing the exploits of heroes. Others widen the definition so as to include not only long narrative poems of romantic or supernatural adventure, but also those of a historical, legendary, mock-heroic, or humorous character. Epic is distinguished from drama in so far as the author frequently speaks in his own person as narrator: and from lyrical poetry by making the

predominant feature the narration of action rather than the expression of emotion. Among the more famous epics of the world's literature may be noted: Homer's *Iliad* and *Odyssey;* Vergil's *Æneid;* the German *Nibelungenlied;* the Anglo-Saxon poem of *Beowulf;* the French *Song of Roland;* Dante's *Divina Commedia;* Tasso's *Gierusalemme Liberata;* Ariosto's *Orlando Furioso;* Milton's *Paradise Lost;* Spenser's *Fairy Queen;* Camoens's *Lusiad* (Portuguese); and Firdusi's *Shah Nameh* (Persian). Hesiod's *Theogony;* the poetic *Edda;* the Finnish *Kalewala;* the Indian *Mahâbhârata* may be described as collections of epic legend. The historical epic has an excellent representative in Barbour's *Bruce;* and specimens of the mock-heroic and humorous epic are found in *The Battle of the Frogs and Mice; Reynard the Fox;* Butler's *Hudibras;* and Pope's *Rape of the Lock.*

Epicte′tus (60–94), a Greek Stoic philosopher, b. in Phrygia. He lived long at Rome, where, in his youth, he was a slave. Though nominally a Stoic, he was not interested in Stoicism as an intellectual system; he adopted its terminology and its moral doctrines, but in his discourses he appeared rather as a moral and religious teacher than as a philosopher.

Epicu′rus (B.C. 342–270), a Greek philosopher, founder of the Epicurean school, was b. in the island of Samos. He settled at Athens B. C. 306, and established a philosophical school. Here he spent the remainder of his life. His pupils were numerous and enthusiastically devoted to him. His theory of the universe was based on the atomic theory of Democritus. The fundamental principle of his ethical system was that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both. Epicurus was a very voluminous writer, but few of his writings are extant, what we possess comprising only some fragments of a *Treatise on Nature,* two letters, and detached passages.

Epicycloi′dal Wheel, a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of the first, fitted so as to revolve about the center of the latter. It is used for converting circular into alternate motion, or alternate into circular. While the revolution of the smaller wheel is taking place any point whatever on its circumference will describe a straight line, or will pass and repass through a diameter of the circle, once during each revolution. In practise, a piston rod or other reciprocating part may be attached to any point on the circumference of the smaller wheel.

Epigæa (-jē′a), a genus of shrubs of the heath order, characterized by having three leaflets on the outside of the five-parted calyx;

and by the corolla being salver-shaped, five-cleft, with its tube hairy on the inside. The trailing arbutus is the Mayflower of North America.

Epilo′bium, the willow herb, a genus of plants, nat. order Onagraceæ. The species are herbs or under-shrubs with pink or purple, rarely yellow, flowers, solitary in the axils of the leaves or in terminal leafy spikes. The seeds are tipped with a pencil of silky hairs, and are contained in a long four-celled capsule. There are more than fifty species scattered over the arctic and temperate regions of the world.

Epimachus, (e-pim′a-kus), a genus of slender-billed (tenuirostral) birds of the Hoopoe family, resembling the birds of paradise in the exceeding luxuriance and brilliancy of their plumage.

Epiph′any, a festival, otherwise called the *manifestation of Christ to the Gentiles,* observed on January 6 in honor of the adoration of our Saviour by the three magi, or wise men, who came to adore him and bring him presents, led by the star. As a separate festival it dates from 813.

Ep′iphyte, a plant which grows and flourishes on the trunks and branches of trees, adhering to the bark, as a moss, lichen, fern, etc., but which does not, like a parasite, derive any nourishment from the plant on which it grows. Many orchidaceous plants are epiphytes.

Epi′rus, a country of ancient Greece corresponding to the southern portion of modern Albania. The most interesting locality in it was Dodona. The inhabitants were only in part Greeks. The Molossians at last acquired the ascendency, and the kings of this tribe took the name of kings of Epirus. The most celebrated king of Epirus was Pyrrhus, who made war upon the Romans. Epirus became a Roman province in 168 B. C., and shared the fortunes of Rome till it was conquered by the Turks.

Epistemol′ogy, that department of metaphysics which investigates and explains the doctrine or theory of knowing; distinguished from *ontology,* which investigates real existence or the theory of being.

Ep′itaph, an inscription upon a tomb or monument in honor or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practise has generally prevailed in Christian countries. On Christian tombstones epitaphs usually give brief facts of the deceased's life, sometimes also the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, etc.

Epithe′lium, in anatomy, the cellular layer which lines the internal cavities and canals of the body, both closed and open, as the mouth, nose, respiratory organs, blood-vessels, etc., and which is analogous to the cuticle of the

outer surface. There are several varieties of epithelium.

Epoch (or Era) is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. The creation and the birth of Christ are the most important of the historical epochs. The creation has formed the foundation of various chronologies, the chief of which are: 1, The epoch adopted by Bossuet, Ussher, and other Catholic and Protestant divines, which places the creation in B. C. 4004. 2, The *Era of Constantinople* (adopted by Russia) which places it in B. C. 5508. 3, The *Era of Antioch*, used till A. D. 284, placed the creation B. C. 5502. 4, The *Era of Alexandria*, which made the creation B. C. 5492. This is also the *Abyssinian Era.* 5, The *Jewish Era*, which places the creation in B. C. 3760. The Greeks computed their time by periods of four years called *Olympiads*, from the occurrence every fourth year of the Olympic games. The first Olympiad, being the year in which Corœbus was victor in the Olympic games, was in the year B. C. 776. The Romans dated from the supposed era of the foundation of their city, April 21 in the third year of the sixth Olympiad, or B. C. 753. The *Christian Era*, or mode of computing from the birth of Christ as a starting-point was first introduced in the sixth century, and was generally adopted by the year 1000. This event is believed to have taken place earlier, perhaps by four years, than the received date. The Julian epoch, based on the coincidence of the solar, lunar, and indictional periods, is fixed at 4713 B. C., and is the only epoch established on an astronomical basis. The *Mohammedan Era*, or *Hejira*, commences on July 16, 622, and the years are computed by lunar months. The Chinese reckon their time by cycles of 60 years. Instead of numbering them as we do they give a different name to every year in the cycle.

Epsom Salt, sulphate of magnesium, a cathartic salt which appears in capillary fibers or acicular crystals. It is found covering crevices of rocks, in mineral springs, etc., but is commonly prepared by artificial processes from magnesian limestone by treating it with sulphuric acid, or by dissolving the mineral *kieserite* in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salt from the clear solution. It is employed in medicine as a purgative, and in the arts. The name is derived from its having been first procured from the mineral waters at Epsom.

Equa′tor, that great circle of our globe every point of which is 90° from the poles. All places which are on it have invariably equal days and nights. Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitude of places both north and south. There is also a corresponding celestial equator in the plane of the terrestrial, an imaginary great circle in

the heavens the plane of which is perpendicular to the axis of the earth. It is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be produced to meet the heavens. During his apparent yearly course the sun is twice in the celestial, and vertically over the terrestrial equator, at the beginning of spring and of autumn. Then the day and night are equal all over the earth, whence the name *equinox.* The *magnetic equator* is a line which pretty nearly coincides with the geographical equator, and at every point of which the vertical component of the earth's magnetic attraction is zero; that is to say, a dipping needle carried along the magnetic equator remains horizontal. It is hence also called the *aclinic line.*

Equato′rial, an astronomical instrument contrived for the purpose of directing a telescope upon any celestial object, and of keeping the object in view for any length of time, notwithstanding the diurnal motion of the earth. For these purposes a principal axis resting on firm supports is mounted exactly parallel to the axis of the earth's rotation, and consequently pointing to the poles of the heavens, being fixed so as to turn on pivots at its extremities. To this there is attached a telescope moving on an axis of its own in such a way that it may either be exactly parallel to the other axis, or at any angle to it; when at right angles it points to the celestial equator. By this means a star can be followed by one motion from its rising to its setting. In some observatories the equatorials have the necessary motion given them by clock-work.

Equestrian Order, the order of "Knights" in ancient Rome. The *equites* or knights originally formed the cavalry of the army. They are said by Livy to have been instituted by Romulus, who selected 300 of them from the three principal tribes. About the time of the Gracchi (123 B. C.) the equites became a distinct order in the state, and the judges and the farmers of the revenue were selected from their ranks. They held their position in virtue of a certain property qualification, and toward the end of the republic they possessed much influence in the state.

Eq′uidæ, the horse family, a family belonging to the order Ungulata, or hoofed mammals, and subdivision Perissodactyla, characterized by an undivided hoof formed of the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth on each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the males and sometimes in both jaws. It is divided into two groups—one including the asses and zebras, the other comprising the true horses.

Equinoc′tial, in astronomy, the circle in the heavens otherwise known as the celestial equator. When the sun is on the equator there is equal length of day and night over all the earth; hence the name *equinoctial. Equinoctial gales*, storms which are observed generally to take place about the time of the sun's

crossing the equator, that is, at the vernal and autumnal equinox, in March and September. *Equinoctial points* are the two points wherein the celestial equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal* point; and the other, in the first point of Libra, the *autumnal* point. These points are found to be moving backward or westward at the rate of 50″ of a degree in a year. This is called the precession of the equinoxes.

E′quinox, the precise time when the sun enters one of the equinoctial points, or the first point of Aries about the 21st of March, and the first point of Libra about the 23d of September, making the day and night of equal length all over the world. At all other times the lengths of the day and of the night are unequal, their difference being the greater the more we approach either pole, while in the same latitude it is everywhere the same.

Eq′uity, in law, the system of supplemental law administered in certain courts, founded upon defined rules, recorded precedents, and established principles, the judges, however, liberally expounding and developing them to meet new exigencies. While it aims to assist the defects of the common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford, equity by no means either controls, mitigates, or supersedes the common law, but rather guides itself by its analogies, and does not assume any power to subvert its doctrines. Courts of equity grant redress to all parties where they have rights, *ex æquo et bono*, and modify and fashion that redress according to circumstances. They bring before them all the parties interested in the subject matter of the suit, and adjust the rights of all.

Equity of Redemption, in law, the advantage allowed to a mortgager of a reasonable time to redeem an estate mortgaged, when it is of greater value than the sum for which it is mortgaged.

Erard, SEBASTIEN (1752–1831), a celebrated musical instrument maker. He went to Paris at the age of eighteen, and in concert with his brother, Jean Baptiste, produced pianofortes superior to any that had previously been made in France.

Erasis′tratus, an ancient Greek physician. He lived in the third century before the Christian era, and was the first who systematically dissected the human body. His description of the brain and nerves is much more exact than any given by his predecessors.

Eras′mus, DESIDERIUS (1467–1536), a Dutch scholar, b. at Rotterdam. In 1492 he went to Paris to perfect himself in theology and polite literature. In 1510 he wrote his *Praise of Folly* while residing with Sir Thomas More, and was appointed Margaret professor of divinity and Greek lecturer at Cambridge. In 1514 he returned to the Continent, and lived chiefly at Basel, where he died.

Eras′tus, the learned name of Thomas Lieber (1523–1584), a Swiss physician, who maintained the opinions from which the well-known epithet of *Erastian*, as now used, is derived. He was successively professor of medicine at Heidelberg, and of ethics at Basel. He maintained in his writings the complete subordination of the ecclesiastical to the secular power; and that the church had no right to exclude any one from church ordinances, or to inflict excommunication.

Er′ato, in Greek mythology, one of the Muses, whose name signifies loving or lovely. She presided over lyric and especially amatory poetry.

Eratos′thenes, (B. C. 276–194), an ancient Greek astronomer, born at Cyrene, in Africa; was librarian at Alexandria, and gained his greatest renown by his investigations of the size of the earth. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic.

Erckmann-Chatrian (shât-ri-än), the joint name of two French-Alsatian writers of fiction. Emile Erckmann, born at Pfalzburg, 1822, studied law at Paris. Alexandre Chatrian, born at Soldatenthal, near Pfalzburg, 1826, was for some time teacher in the Pfalzburg College. They formed a literary partnership in 1847, but it was not till the appearance of *L'Illustre Docteur Mathéus* in 1859 that success attended them.

Er′ebus, in Greek mythology, the son of Chaos and Darkness. The name Erebus was also given to the infernal regions.

Erebus, Mount, a volcano of the Antarctic regions in S. Victoria Land; height 12,400 ft.

Erectheus (e-rek′thūs), in Greek mythology, a personage associated with the early history of Athens, and to whom a fine temple was built on the Acropolis.

Er′furt, an important town in the Prussian province of Saxony. It has a fine cathedral dating from the thirteenth century, and several handsome Gothic churches. The university, founded in 1378 and suppressed in 1816, was long an important institution. There are still a royal academy of science and a royal library with 60,000 vols. The monastery (now an orphanage) was the residence of Luther from 1501 to 1508. The industries are varied, including clothing, machinery, leather, shoes, ironmongery, chemicals, etc. Pop. 58,385.

Er′got, the altered seed of rye and other grasses caused by the attack of a fungus. The seed is replaced by a dense homogeneous tissue largely charged with an oily fluid. In its perfect state this germinates and produces the claviceps. When diseased rye of this kind is eaten in food for sometime, it sometimes causes death by a kind of mortification called dry gangrene.

Eric, the Red, a Norwegian navigator, who located in Iceland in 982. He sailed from Bredifiord in 983 to reach some western shore visited by one of his countrymen in former times. The land which he found he called Greenland. In 985 he returned to Iceland, where he so interested the people in his discovery that they organized a fleet of twenty sail

for a new voyage. Some of the ships were lost in a storm, but he succeeded in reaching the Greenland coast with fourteen, and located on the fiord at some distance from the ocean. His son Lief, twelve years later, is said to have discovered the continent of North America, which he called Markland and Finland.

Ergot of Rye.

Erica(e-rī′ka), the heath, a large genus of branched, rigid shrubs, type of the nat. order Ericaceæ, most of which are natives of South Africa, a few being found in Europe and Asia. The leaves are narrow and rigid, the flowers are globose or tubular, and four-lobed.

Ericaceæ, a nat. order of oxogenous plants.

Er′icsson, JOHN (1803–1889), engineer, b. in Sweden. He served for a time in the Swedish Army; removed to London in 1826, and to New York in 1839. He is identified with numerous inventions and improvements on steam machinery and its applications. His chief inventions are his caloric engine, the screw propeller (1836), which has revolutionized navigation, and his turret ships, the first of which, the *Monitor*, distinguished itself in the American Civil War, and inaugurated a new era in naval warfare. He latterly devoted himself to studies of the earth's motion and the intensity of solar heat.

Erie (ē′ri), one of the great chain of North American lakes, between Lakes Huron and Ontario, about 265 mi. long, 63½ mi. broad at its centre, from 40 to 60 fathoms deep at the deepest part; area 9,600 sq. mi. The whole of its southern shore is within the territory of the U. S., and its northern within that of Canada. It receives the waters of the upper lakes by Detroit River at its southwestern extremity, and discharges its waters into Lake Ontario by the Niagara River at its northeast end. The Welland Canal enables vessels to pass from it to Lake Ontario. It is shallow compared with the other lakes of the series, and is subject to violent storms. The principal harbors are Buffalo, Erie, Cleveland, etc.

Erie, a city, Pennsylvania, an important railway and commercial center on the southern shore of Lake Erie. There are numerous iron works (including foundries, rolling mills, blast furnaces, etc.), petroleum refineries, breweries, tanneries, wood working factories, etc. The harbor is one of the best on the lake. Pop. 1900, 52,733.

Erie Canal, the largest in the U. S., serving to connect the great lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 363 mi. long; has in all 72 locks; a surface width 70 ft., bottom width 42 ft., and depth 7 ft. It is carried over several large streams on stone aqueducts; cost nearly $10,000,000, and was opened in 1825. The navigation is free.

Eriom′eter, an optical instrument for measuring the diameters of minute particles and fibers, from the size of the colored rings produced by the diffraction of the light in which the objects are viewed.

Eris, in the Greek mythology, the goddess of discord. Not being invited to the marriage of Peleus, she revenged herself by means of the *apple of discord.*

Er′ivan, a Russian town, capital of government of the same name in the lieutenancy of the Caucasus, on the Sanga, north of Mount Ararat. It has a citadel, barracks, a cannon foundry, and some manufactures. Pop. 12,505. The government has an area of 10,705 sq. mi., and a pop. of 583,957.

Er′mine, the stoat, a quadruped of the weasel tribe, found over temperate Europe, but commonly in the north. In consequence of the change that occurs in the color of its fur at different seasons—by far most marked in the Arctic regions—it is not generally known that the ermine and stoat are the same. In winter,

Ermine.

in cold countries or severe seasons, the fur changes from a reddish brown to a yellowish white, or almost pure white, under which shade the animal is recognized as the ermine. In both states the tip of the tail is black. Like many other species of this genus the ermine has the faculty of ejecting a fluid of a musky odor. Its fur is short, soft, and silky; the best skins being brought from Russia, Sweden, and Norway, and Hudson's Bay territories. It was formerly one of the insignia of royalty, and is still used by judges. When used as linings of cloaks the black tuft from the tail is sewed to the skin at irregular distances.

Erne, Lough, a lake, Ireland, county Fermanagh, consisting of a north or lower, and a

south or upper lake, connected by a narrow, winding channel, and properly forming only expansions of the river Erne. Its entire length is about 40 mi.; average breadth 6 mi. It contains numerous small islands, and is well stocked with fish. The river Erne rises in Lough Gounagh, in the county of Longford, flows through Loughs Oughter and Erne, and falls into Donegal Bay below Ballyshannon. Length, 72 mi.

Erosion Theory, in geology, the theory, now held by all geologists, that valleys are due to the wearing influences of water and ice, the latter chiefly in the form of glaciers, as opposed to the theory which regards them as the result of fissures in the earth's crust produced by strains during its upheaval.

Errat'ics (or erratic blocks), in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus on the slopes of the Jura Mountains immense blocks of granite are found which have traveled 60 mi. from their original situation. Similarly masses of Scotch and Lake district granites and of Welsh rocks occur not uncommonly in the surface soil of the Midland counties of England.

Erskine, Thomas, Lord Erskine (1750–1823), Scottish lawyer, the youngest son of the tenth earl of Buchan. He was educated partly at the high school of Edinburgh, and partly at the University of St. Andrews. After serving four years in the navy and seven in the army he commenced the study of law, and in 1778 both took his degree at Cambridge and was called to the bar. His success was immediate. In 1783 he was elected member of Parliament for Portsmouth, a seat he held till 1806, when he was raised to the peerage. In 1789 he defended Mr. Stockdale, a bookseller, for publishing what was charged as a libelous pamphlet in favor of Warren Hastings. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his *Rights of Man*, he declared that, waiving all personal convictions, he deemed it right, as an English advocate, to obey the call; by the maintenance of which principle he lost his office of attorney general to the Prince of Wales. In the trials of Hardy, Tooke, and others for high treason in 1794, which lasted for several weeks, the ability displayed by Erskine was acknowledged by all parties. 1802 the Prince of Wales made him keeper of his seals for the duchy of Cornwall. In 1806 he was created a peer, and raised to the dignity of lord chancellor.

Eruptive Rocks, in geology, those which, like lava, bassalt, granite, etc., have broken through other rocks while in a molten state.

Eryn'go, a genus of plants belonging to the natural order of Umbelliferæ. There are upward of 100 species found in the temperate and sub-tropical climates, but chiefly in South America. An American species is known by the name of rattlesnake weed.

Erythræ'a, a genus of annual herbs, of which *Centaury* is the best known species.

Erzerum (Erzeroum, or Erzeroom) (er'zeröm), a city of Turkish Armenia, capital of a vilayet with an area of 27,000 sq. mi., and a pop. of 582,745. The town is about 6,000 ft. above sea level, forms an important strategical center, and has become a principal frontier fortress. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade, and is a chief halting place for Persian pilgrims on their way to Mecca. Pop. 38,894.

Erzgebirge (erts'ge-bir-ge) ("Ore Mountain"), a chain of European mountains forming a natural boundary between Saxony and Bohemia, nearly 120 mi. in length and 25 mi. broad. The highest summits, which are on the side of Saxony, rise to 3,800 or 3,900 ft. The mountains are rich in silver, iron, copper, lead, cobalt, arsenic, etc.

E'sau, the eldest son of Isaac, and twin brother of Jacob. The story of his marriage, of his loss of birthright through the craft of Rebekah and Jacob, and of his quarrel and reconciliation with Jacob, are told in the book of Genesis. He was the progenitor of the Edomites, who dwelt on Mount Seir.

Escanaba, Delta co., Mich., on Little Bay, 121 mi. n. of Green Bay. Railroad, C. & N. W. Industries: woodenware factory, iron foundry. Is the outlet of a mining district w. and n. and headquarters of Peninsula division C. & N. W. Ry. Was first settled in 1863 by employees of railway company and became a city in 1883. Pop. 1900, 9,549.

Escape'ment, the general contrivance in a timepiece by which the pressure of the wheels (which move always in one direction) and the vibratory motion of the pendulum or balance-wheel are accommodated the one to the other. By this contrivance the wheelwork is made to communicate an impulse to the regulating power (which in a clock is the pendulum and in a watch the balance wheel), so as to restore to it the small portion of force which it loses in every vibration, in consequence of friction and the resistance of the air. The leading requisite of a good escapement is that the impulse communicated to the pendulum or balance wheel shall be invariable, notwithstanding any irregularity or foulness in the train of wheels. Various kinds of escapements have been contrived, some of which are shown in the accompanying figure.

Es'car (Es'kar), a late geological formation in the superficial drift, generally consisting of a long, linear ridge of sand and gravel, including pieces of considerable size. The materials are derived from the waste of till or boulder-clay, and their arrangement took place probably under water over which icebergs floated, for in Sweden particularly angular, erratic blocks are often deposited on the *escar*.

Escheat (es-chēt), in law, a species of reversion arising from default of heirs or by forfeiture. That which falls or lapses to the original proprietor, or to the state, as lands or other property. By modern legislation there can be no escheat on failure of the whole blood wherever there are persons of the half-blood capable of inheriting.

Escu'rial, a remarkable building in Spain, comprising at once a palace, a convent, a church, and a mausoleum. It is distant from

Eskimo Winter Station, Greenland.

Madrid about 24 mi. in a northwesterly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. It was built by Philip II, and dedicated to St. Lawrence, in commemoration of the victory of St. Quentin, fought on the festival of the saint in 1557. It is popularly considered to be built on the plan of a gridiron, from the fact that St. Lawrence is said to have been broiled alive on a sort of large gridiron. It was begun in 1563 and finished in 1584. The church is the finest portion of the whole building. The dome is 60 ft. in diameter, and its height at the center is about 320 ft. The library contains a valuable collection. The Escurial was partly burned in 1671. It was restored by Ferdinand VII, but the monks, with their revenues which supported it, have long since disappeared. In 1872 it was fired by lightning, and suffered serious damage.

Esdrae'lon, Plain of, a plain extending across Palestine from the Mediterranean to the Jordan, and drained by the river Kishon.

Eskimo, a race inhabiting the Arctic coasts of North America, from Greenland to Bering's Strait, and extending into Asia. They call themselves *Inu-it*, the people; their other name is from an Algonquin word signifying eaters of raw flesh. They consist of three principal stocks—the Greenlanders; the Eskimo proper, in Labrador; and the Western Eskimo, found along Hudson's Bay, the west side of Baffin's Bay, the polar shores as far as the mouths of the Coppermine and Mackenzie rivers, and both on the American and Asiatic sides of Bering's Strait. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique, and yellow and brownish skin. Sealskins, reindeer, and other furs are used as materials for dress, according to the season, as well as skins of otters, foxes, martens, etc. In summer they live in tents, covered with skins; in winter they may be said to burrow beneath the snow. In Greenland, houses built of stone and cemented with turf are used as permanent habitations. Vegetation being extremely stunted within the limits of their territories, their food consists of the flesh of whales, seals, walrus, etc., often eaten raw; and they show remarkable skill in fishing and hunting. Their weapons are bows and arrows, spears or lances, generally pointed with bone, but sometimes with metal. Their only domestic animal is the Eskimo dog. In intellect they are by no means deficient; in manners they are kind and hospitable. Their religious ideas appear scanty, but success has attended the labors of the Danish missionaries in teaching them the Christian religion.

Eskimo Dog (or Esquimau Dog), a breed of dogs extensively spread over northern regions of America and Eastern Asia. It is rather larger than the English pointer, but appears less on account of the shortness of its legs. It

Eskimo Dog.

has oblique eyes, an elongated muzzle, and a bushy tail, which give it a wolfish appearance. The color is generally a deep dun, obscurely barred and patched with darker color. It is the only beast of burden in these latitudes, and with a team of such dogs attached to his sledge the Eskimo will cover 60 mi. a day for several successive days.

Espar'to, a plant growing in Spain and North Africa, long applied to the manufacture of cordage, matting, etc., and now ex-

tensively employed for paper-making. This plant is a species of grass 2 to 4 ft. high, covering large tracts in its native regions, and also cultivated, especially in Spain. Formerly the supply of esparto was almost wholly obtained from Spain, but it is now obtained in still larger quantity from Algeria (where it is called *alfa*), and from Tripoli and Tunis. The paper made from it is excellent; it may be also reduced to a fibrous state and used for stuffing mattresses, etc.

Espir'ito-Santo ("Holy Spirit"), a maritime province, Brazil, bounded n. by Bahia, s. by Rio de Janeiro; length about 260 mi.; breadth, about 120 mi.; area 43,290 sq. mi.; pop. 100,-717.

Espir'itu-Santo, an island of the Pacific, the largest of the New Hebrides, with some 20,000 inhabitants.

Esquimault (es-kēmält), a harbor and naval station on the s. e. coast of Vancouver Island, about 3 mi. from Victoria, the capital of British Columbia. The harbor is almost landlocked, and with the "Royal Roads" outside, is capable of giving safe anchorage to a fleet of vessels of the largest size.

Essen, a town of Rhenish Prussia, 18 mi. n.e. of Düsseldorf, founded in the ninth century, and adorned with a fine church dating from 873. It has recently increased with great rapidity, and is celebrated for the steel and iron works of Krupp, the most extensive in Europe, employing about 20,000 workmen. This great establishment was started in 1827, with only two workmen. The works occupy 1,000 acres, and the firm possesses coal and iron-stone mines. The rifled steel cannon made here are supplied to most of the armies of Europe. In the Krupp works there is now a steam hammer of 150 tons. Pop. 65,064.

Essential Oils, volatile oils usually drawn from aromatic plants by subjecting them to distillation with water, such as the oils of lavender, cloves, peppermint, etc.

Essequibo (es-se-kē-bō), a river of British Guiana which flows into the Atlantic by an estuary 20 mi. in width after a course of about 450 mi. The district or division of Essequibo is well cultivated and extremely fertile, producing coffee, cotton, cocoa, and sugar. Pop. 36,000.

Essex, a maritime county in the s.e. of England, area 987,032 acres. The soil is generally extremely fertile, and particularly well adapted for the growth of wheat. On the coast are some valuable oyster-beds, the oysters from which are exported in considerable quantities. The manufactures of the county are not very extensive, the chief being, crape, silks, straw plait, etc. The chief towns are Chelmsford, the county town, West Ham, Colchester, Malden, and Harwick. Pop. 785,399.

Essex, Robert Devereux, second earl of (1567–1601). In 1596 he was commander of the troops in an expedition against Spain, and distinguished himself by the capture of Cadiz. In an expedition next year he was less fortunate, and the queen, with whom he was always quarreling, received him coldly. He was appointed lord lieutenant of Ireland in 1599. Later he returned to England and was executed for treason.

Esslingen (es'ling-ėn), a town of Germany, in Würtemberg, on the Neckar, 7 mi. e.s.e. of Stuttgart. It is of Roman origin, was long an imperial free town, has walls flanked with towers, a castle, and an ancient Gothic church, with a tower 230 ft. high. It has manufactures of machinery, articles of wood, cutlery, philosophical instruments, spinning and other mills, etc. Pop. 20,865.

Este (es'tā), one of the most ancient and illustrious families of Italy. In the eleventh century the house of Este became connected by marriage with the German Welfs, or Guelphs, and founded the German branch of the house of Este, the dukes of Brunswick and Hanover.

Esterha'zy, a family of Hungarian magnates, whose authentic genealogy goes back to the first half of the thirteenth century.

Esther, a Jewess who became the queen of Ahasuerus, king of Persia, and whose story is told in the book of the Old Testament called by her name. This book is supposed by some to be the composition of the uncle of the heroine. Various opinions are held regarding the time and truth of the story; but the feast of Purim which commemorates the events narrated is still observed by the Jews during the month Adar.

Esthonia, a maritime government of Russia. About a fourth of the surface is covered with forests of pine, birch, and alder. The crops include a little wheat, much barley and oats, and some flax, hops, and tobacco. Cattle are reared, and active fisheries are carried on. The peasantry are almost all of Finnish origin, and speak a Finnish dialect. In the tenth and twefth centuries it belonged to Denmark; it was afterward annexed by Sweden, and in 1710 was seized by Russia. Revel is the capital. Pop. 379,875.

Estop'pel, in law, anything done by a party himself, which puts a period to an action by closing the ground of controversy.

Esto'vers, in law, necessaries or supplies. *Common of Estovers* is the liberty of taking the necessary wood for a house or farm from another's estate.

Estremadu'ra, a western division of Spain, consisting of the provinces of Badajoz and Caceres. It is fertile, but not cultivated to its full extent. The Tagus and Guadiana intersect it east to west. Immense flocks of sheep graze on the rich plains. The area is about 16,700 sq. mi. and the pop. 789,123.

Estremadura, a maritime province of Portugal, divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous. Wines and olives are the principal produce. The principal city is Lisbon. Area 6,876 sq. mi.; pop. 946,472.

Etæ'rio (Eterio), in bot. a collection of distinct indehiscent carpels, either dry upon a fleshy receptacle as the strawberry, or dry upon a dry receptacle as the ranunculus, or fleshy upon a dry receptacle as the raspberry, the parts being small drupes.

Eta′wah, a town, Hindustan, N. W. Provinces, capital of the district of same name, on left bank of the Jumna, picturesquely situated among ravines, and richly planted with trees. It has some good buildings, and a considerable trade. Pop. 34,721. The district has an area of 1,694 sq. mi., and a pop. of 722,371.

Etching, the art of producing designs upon a plate of steel or copper by means of lines drawn with an *etching needle* (a fine-pointed steel tool), the lines being drawn through a coating or varnish (the *ground*), and *bitten in* by some strong acid which can only affect the plate where the varnish has been removed. See *Engraving* and *Zincography.*

Ete′sian Winds, winds blowing at stated times of the year; applied especially to northerly and northeasterly winds which prevail at certain seasons in the Mediterranean regions.

Eth′elbert, king of Kent (560–616), succeeded his father and reduced all the Anglo-Saxon states, except Northumberland, to the condition of his dependents. Ethelbert married Bertha, the daughter of Caribert, king of Paris, and a Christian princess, an event which led indirectly to the introduction of Christianity into England by St. Augustine.

Ethelbert, king of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in 857, and in 860, on the death of his brother Ethelbald, became sole king.

Eth′elred I, king of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom.

Ethelred II (968–1016), king of England, son of Edgar, succeeded his brother, Edward the Martyr, in 978, and, for his want of vigor and capacity, was surnamed *the Unready.* In his reign began the practise of buying off the Danes by presents of money. After repeated payments of tribute he effected, in 1002, a massacre of the Danes; but this led to Sweyn gathering a large force together and carrying fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as king of England; while Ethelred, in 1013, fled to Normandy. On the death of Sweyn he was invited to resume the government, and died at London in the midst of his struggle with Canute.

Eth′elwulf, king of England, succeeded his father, Egbert, about 837; d. 857. His reign was in great measure occupied in repelling Danish incursions; but he is best remembered for his donation to the clergy, which is often quoted as the origin of the system of tithes.

E′ther, a hypothetical medium of extreme tenuity and elasticity supposed to be diffused throughout all space (as well as among the molecules of which solid bodies are composed), and to be the medium of the transmission of light and heat.

Ether, in chem. a very light, volatile, and inflammable fluid, produced by the distillation of alcohol with sulphuric acid. It is lighter than alcohol, of a strong, sweet smell, susceptible of great expansion, and has a pungent taste. A mixture of vapor of ether with atmospheric air is extremely explosive. Ether produces an intoxication of short duration, and is sometimes used as an anæsthetic.

Ethics, otherwise called *Moral Philosophy* or *Morals,* is the science which treats of the nature and laws of the actions of intelligent beings, considered as to whether they are *right* or *wrong, good* or *bad.* The science is more or less closely connected with theology, psychology, politics, political economy, and jurisprudence, but what most strictly belongs to it is the investigation of the principles and basis of duty or the moral law, and an inquiry into the nature and origin of the faculty by which duty is recognized. Various answers have been given to the question why we call an action good or bad, such as that it is consistent or not with the will of God, or with the nature of things, or with the greatest happiness of the greatest number, or that an inward faculty decides it to be such or such; and a great variety of *ethical* systems have been proposed. The foundations of the leading systems were laid in antiquity, the names of Socrates, Plato, Aristotle, Epicurus, the Cynics and the Stoics being especially prominent. The introductian of Christianity brought a new element into ethical speculation, and among Christians ethics were intimately associated with theology, and morality was regarded as based on and regulated by a definite code contained in the sacred writings. The speculations of Greeks were not, however, disregarded, and some of the ablest Christian moralists (as Augustine, Peter Lombard, Erigena, Anselm, Aquinas, etc.) endeavored to harmonize the Greek theories with the Christian dogmatics. Most modern ethical systems consider the subject as apart from theology as based on independent philosophical principles, and they fall into one of two great classes — the utilitarian systems, which recognize as the chief good, happiness, or the greatest possible satisfaction of the tendencies of our nature; and the rationalistic systems, which recognize that ideas of law and obligation can have their source only in reason. The first of the modern school in England was Hobbes (1588–1679). Among subsequent names are those of Cudworth, Locke, Clarke, Shaftesbury, Butler, Hutcheson, Hume, Adam Smith, Reid, Paley, J. S. Mills, Herbert Spencer. Another theory of ethics places the moral principle in the sentimental part of our nature, that is, in the direct sympathetic pleasure or sympathetic indignation we have with the impulses which prompt to action or expression. By means of this theory, Adam Smith explains all the phenomena of the moral consciousness. In considering the systems which recognize that the ideas of law and obligation can have their source only in reason, the question, "what is the source of the laws by which reason governs?" gives rise to a number of psychological theories, among which we may notice Clarke's view of the moral principles, as rational institutions or

axioms analogous to those of mathematics; Butler's theory of the natural authority of conscience; the position of Reid, Stewart, and other members of the later intuitional school, who conceive a moral faculty implanted in man which not only perceives the "rightness" or "moral obligation" of actions, but also impels the will to perform what is seen to be right. Very similar as far as classification goes, is the position of Kant, who holds that reason recognizes the immediate obligation of certain kinds of conduct, and that an action is only good when done from a good motive, and that this motive must be essentially different from a natural inclination of any kind.

Ethiopia (or *Æthiopia*), in ancient geography the country lying to the south of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia, and other adjacent districts; but its limits were not clearly defined. In ancient times its history was closely connected with that of Egypt, and about the eighth century B. C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. In the sixth century B.C. the Persian Cambyses invaded Ethiopia; but the country maintained its independence till it became tributary to the Romans in the reign of Augustus. Subsequently Ethiopia came to be the designation of the country now known as Abyssinia, and the Abyssinian monarchs still call themselves rulers of Ethiopia.

The *Ethiopian Language*, or more accurately the *Geez* language, is the old official and ecclesiastical language of Abyssinia, introduced into that kingdom by settlers from South Arabia. It is a Semitic language resembling Aramaic and Hebrew as well as Arabic. It has a Christian literature of some importance. The principal work is a translation of the Bible, including the Old and New Testaments and Apocrypha. The language is to some extent represented by the modern dialects of Tigre, and by that spoken by some nomadic tribes of the Soudan.

Ethiops Mineral, the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold.

Ethnol'ogy and **Ethnog'raphy,** sciences treating of man, the former analyzing the social phenomena of mankind as shown in their customs, languages, institutions, etc.; the latter being more concerned with descriptive details and the orderly collection of facts relating to particular tribes and localities. Besides these terms there is the term *Anthropology*, used by some to indicate the general science or natural history of mankind, of which the other two are parts. Here we can only give a few particulars bearing on the strictly ethnological and ethnographic divisions of the subject. The unity or plurality of species of the human race is a question that has given rise to much discussion. The most common view in the past has probably been that which regards all mankind as descended from Adam and Eve, attributing the great differences exhibited by different races to climate and other causes acting for a long period of time. Many have held that such differences were not to be so accounted for, and that the various typical races of the earth were not descended from a single pair, but were separately created in separate localities. Darwin has shown how an accumulation of differences amounting to the appearance of a distinct species may arise from the continual modifications of a single primordial form. Certainly among men the variability of the same race under different climatic conditions is very striking. Even within a comparatively small period of time physical surroundings have induced typical differences between the lithe, sparely-fleshed Yankee of New England, and the plump, rosy-cheeked Englishman; and the Boer of South Africa, with its dry climate, has developed a type as decidedly different from his original stock in moist Holland. The theory of the development of the human race from a single species demands a vast duration of time; and the flint implements discovered intermingled with remains of the mammoth and other extinct animals have proved that man was a contemporary of the mammoth, the cave-bear, and other mammalia of the geological period antecedent to our own, though how distant that period was, as measured by thousands of years, it is difficult to say. Another interesting point is in regard to the first home of the human race. This of course is quite uncertain, but probably it was either in Western Asia or in Africa, and we may naturally conclude that where the mammalia of the highest characteristics appear there was the possible birthplace and center of distribution of mankind.

When we attempt to classify mankind we can scarcely find any one physical characteristic belonging exclusively to a single race. At most we can only say that certain characteristics are the preponderant ones in certain races. In seeking racial characteristics ethnologists make use of various principles of classification. Some give the first place to the shape of the head. Camper, the Dutch anatomist, was the first who attempted to make a scientific distinction of races on this principle, taking as the basis of measurement the amount of the facial angle. But Camper's method, though it illustrates excellently the great differences which exist, between, say, the anthropoid apes with an angle of 42°, the African negro with an angle of 70°, and the European with an angle of 80°, is without certainty, it being possible to find in the population of a single, large town as wide variations of the facial angle as exist between distinct races. Camper's method was therefore superseded by the method of Blumenbach, which is based on consideration of all the chief distinctions in the shape of the head according to which he classified the human family into five varieties: the Caucasian, Mongolian, Ethiopian, Malay, and American. These five varieties were cut down to three by Cuvier, who treated the Malay and American as subdivisions of the Mongolian; and extended by Doctor Prichard, who divided the Caucasian class into a Semitic and an Aryan, or Indo-European class. Lath-

am's classification was into 1, Mongolidæ (Chinese, Turks, Malays, American races, etc.); 2, Atlantidæ (African races, Jews and Arabs); 3, Japetidæ (Indo-Europeans). Among the latter attempts made to find a new principle of classification we may mention that of Retzius, based on the relative length and breadth of the skull, according to which mankind are divided into long-skulled and short, broad-skulled races. Later developments of craniology have introduced a third class, representing a mean between the other two. The capacity of the brain cavity is also a favorite method with some ethnologists. Here the European stands highest with 92.1 cubic in.; the Australian lowest with 81.7. The character of hair and color of skin has also been used by Huxley as the basis of his classification, which divides mankind into 1, *Ulotrichi*, crisp or woolly haired people with yellow or black skin, comprising Negroes, Bushmen, and Malays; 2, *Leiotrichi*, smooth-haired people, subdivided into Australioid, Mongoloid, Xanthochroic (fair whites), and Melanochroic (dark whites) groups. But many ethnologists hesitate to accept a classification which brings together nations apparently unrelated, such as the Australians, the ancient Egyptians, and the tribes of Southern India. On the other hand, the character of the hair is found to be one of the surest tests in separating neighboring races, such as the Papuan, and the Malayan, and Australian tribes. Oscar Peschel's classification, based on a number of different particulars, such as the shape of the skull, the color of the skin, the nature and color of the hair, the shape of the features, etc., is as follows:—

1. *The Australians.*—Characters: skull of the "long-skulled" type, the jaws being also protruded. The nose is narrow at the root, widening greatly below. The mouth is wide and unshapely. The body is thickly covered with hair; the hair is black, elliptical in section, that on the head being frizzly, and standing out so as to form a shaggy crown. The color of the skin is dark as a rule, sometimes black, though a light copper-red also occurs.

2. *The Papuans.*—This race, which is the one most closely allied to the Australians, occupies New Guinea, New Caledonia, the Solomon Islands, New Hebrides, the Fiji Islands, etc. The most distinctive mark is their peculiarly flattened and abundant hair, growing in tufts, and forming a spreading crown round the head. The skin is always dark, the skull high and narrow; the jaws protruded; the lips fleshy and somewhat swollen; the nose hooked somewhat after the Jewish type.

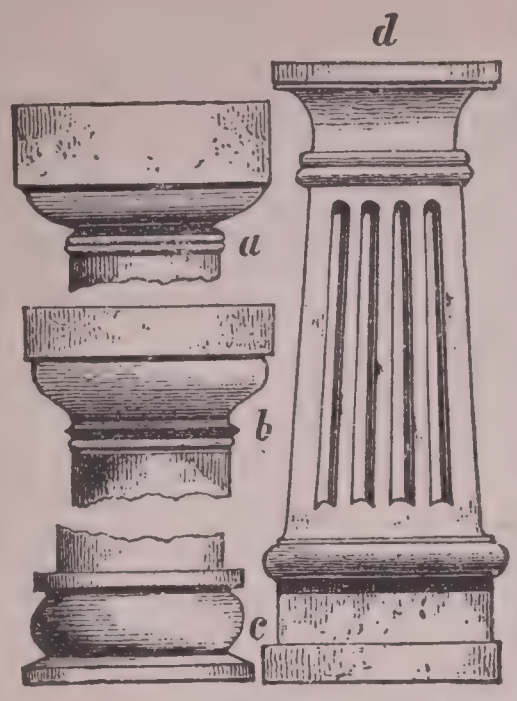
3. *The Mongoloid Nations.*—To this race belong the Polynesian and Asiatic Malays, the people of Southeastern and Eastern Asia, the Thibetese, all the Northern Asiatics, with their kinsmen in Northern Europe, and lastly the aboriginal population of America. The common characteristics are: long, straight hair, circular in section; almost complete absence of beard and body hair; skin dark-colored, varying from leather-yellow to deep brown, sometimes inclining to red; prominent cheek-bones, and eyes in general set obliquely. The various members of the Mongoloid race may be classed under the following subdivisions: (*a*) The *Malay race*, comprising the Malays of Malacca, Sumatra, Java, etc.; the inhabitants of Madagascar, the New Zealanders, the natives of the Sandwich Islands, etc. (*b*) *Southern Asiatics with monosyllabic languages*, comprising the Chinese, Indo-Chinese (Burmese, Siamese, Anamese, etc.), Thibetese, etc. (*c*) *Coreans and Japanese.* (*d*) *Northern Mongoloids of the Old World*, comprising the true Mongols, Turks, Finns, Lapps, Magyars, Bulgarians, etc., all much resembling the Chinese and Indo-Chinese group in physical characters. (*e*) *Northern Nations of doubtful position:* The Yenisei Ostiaks, the Ainos of Yesso, the inhabitants of Saghalien, etc. (*f*) *The Bering's Nations*, of which the Esquimaux, or Eskimo, are the most important. (*g*) *The American Aborigines*, or Red Indians.

4. *The Dravidians, or Aborigines of India.*—These tribes have the skin generally very dark, frequently quite black; their hair is long and black, not straight but crimped or curly; the hair of beard and body grows profusely; the lips are thick and fleshy, somewhat like those of the negro, but the jaws are never prominent. The Dravidians comprise the Tamuls, Telugus, Gonds, Santals, or Sonthals, etc.

5. *The Hottentots and Bushmen.*—These are tribes of little importance inhabiting South Africa. They have their hair tufted and matted, the beard scanty, the body almost hairless; the lips are full, but not so much so as with the negroes; the nose is of the snub shape; the opening of the eyes is narrow but not oblique. They are slimly built, and the Bushmen in particular low in stature; their color is yellowish or yellowish-brown.

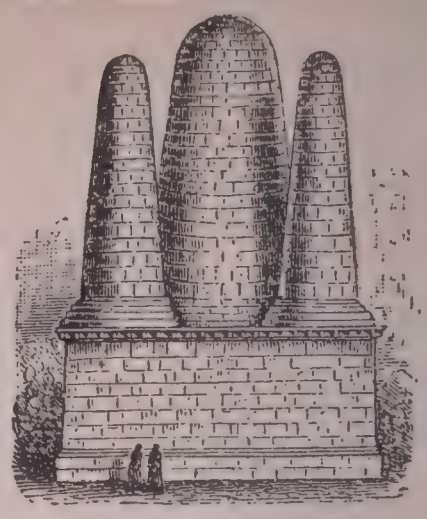
6. *The Negroes.*—The negroes inhabit Africa from the southern margin of the Sahara to the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. They display great variety in external characteristics, and what is popularly considered the typical negro is rarely met with. The color of the skin passes through every gradation, from ebony-black to dark brown, copper-red, olive, or yellow. In some tribes the nose is straight, in others hooked, though often broad and flat. The hair of the head is generally short, elliptic in section, and much crimped; that on the body is not plentiful; whiskers are comparatively rare. The negroes may be divided into the Bantu negroes (including the Kaffirs, Bechuanas, etc.) and the Soudan negroes, these divisions being based on differences in language. It is in the Soudan region that the most typical members of the negro race are found.

7. *The Mediterranean Nations.*— These include all Europeans who are not Mongoloids, the North Africans, all Western Asiatics, and the Hindus. Among them are the highest members of the human race. The northern nations have the skin quite fair; the southern

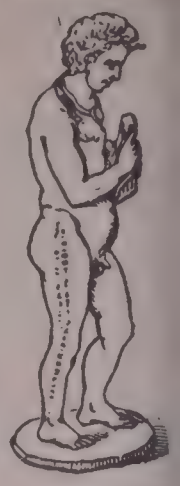


1. Etruscan Order of Columns.
a Capital of Column.
b Capital of Pillar.
c Foot of Column.
d Pillar from a Tomb.

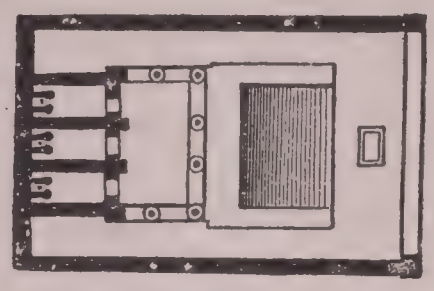
2. Gate at Falerii.



3. Monument on the Tomb of the Horatians and Curiatians.

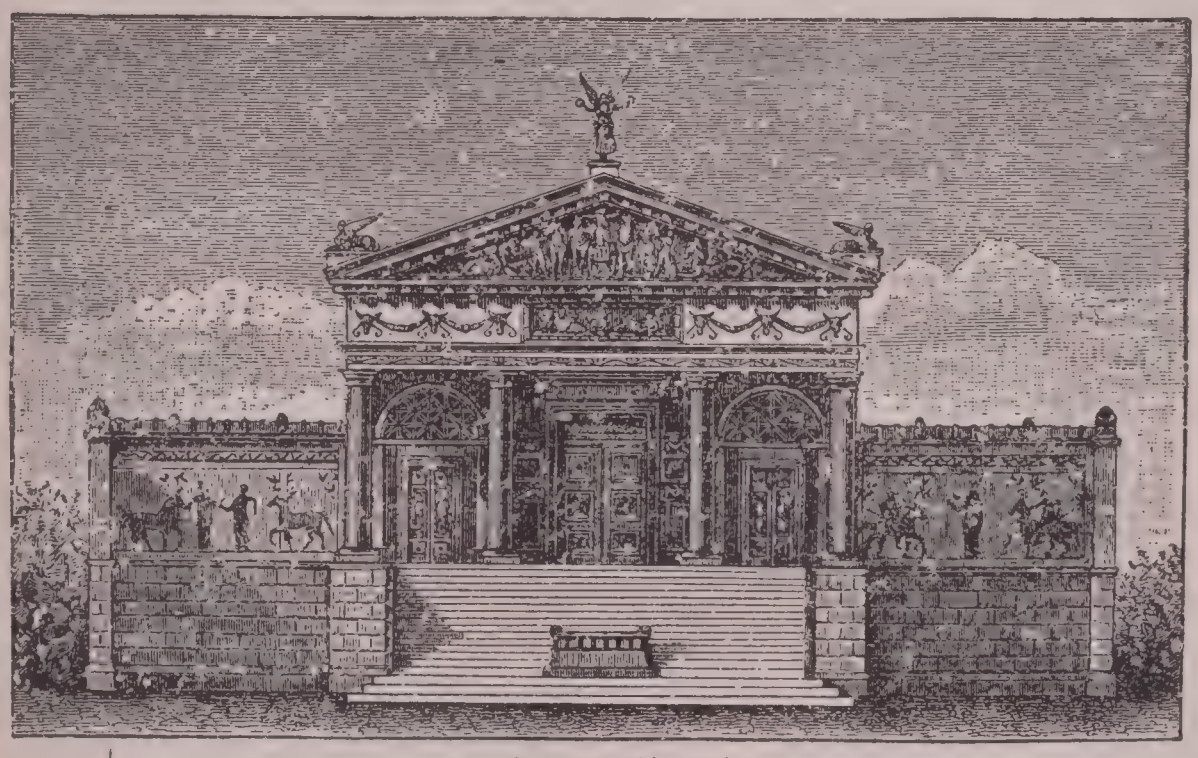


4. Boy with Goose. (Museum at Leyden).



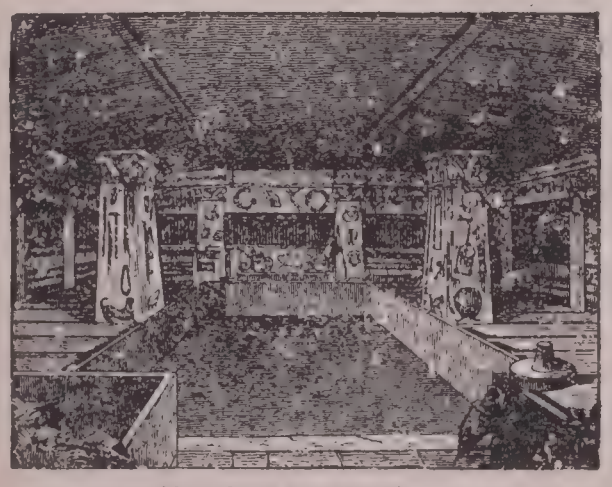
5. Ground Plan of the Etruscan Temple.

6. Capitoline She-Wolf with Romulus and Remus.



7. Etruscan Temple.

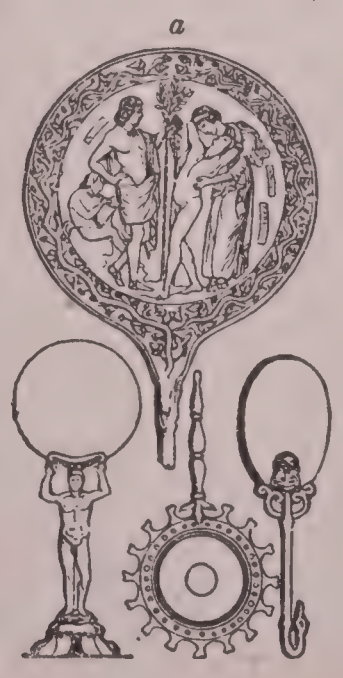
8. Ficoronian Ciste, mystic chest used in worship.



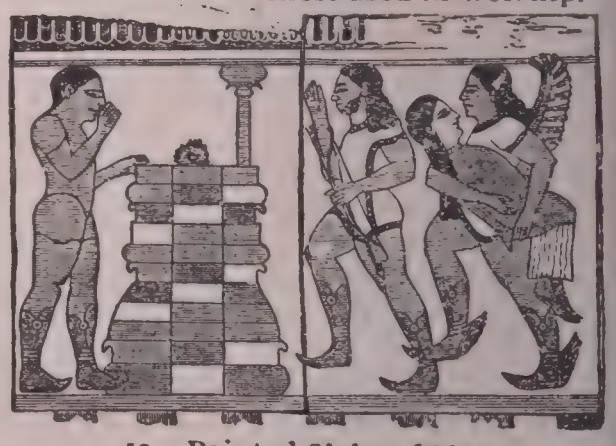
9. Tomb at Cervetri.

10. Sarcophagus from Cære.

a



11. Hand-mirror; with Semele and Bachus.



12. Painted Slabs of Clay.

13. Wall Paintings.

have it darker; in North Africa and Eastern Asia it becomes yellow, red, or brown. The nose has always a high bridge; protruding and prominence of the jaws and cheek-bones are rare; the lips are never intumescent, and in no other race are refined and noble features so frequent. Subdivisions are: (*a*) *The Hamites* comprising the ancient Egyptians, the Copts of Egypt, and the Nubians, the Berbers and Gallas. (*b*) *The Semites.* These comprise the Jews, Arabs, and Abyssinians, and the ancient Canaanites, Assyrians, Babylonians, and Phœnicians. (*c*) *The Indo-European, or Aryan family.* This family is divided into branches, a European and an Asiatic. The European comprises the Germanic (or Teutonic) nations (English, Germans, Dutch, Danes, Norwegians, Swedes, etc.), the Romance nations (French, Italians, Spaniards, Portuguese), the Slavonians (Russians, Bohemians, Servians, etc.), the Greeks, and lastly the Celts. The Asiatic comprises the Hindus, Afghans, Persians, Armenians, and Kurds. (*d*) *Europeans of doubtful positions.* These include the Basques of the northeast of Spain and southwest of France and various tribes in the Caucasus.

Etienne (ā-ti-ān), St., a town of Southern France, dep. Loire, on the Furens, 32 mi. s.w. of Lyons. The town stands in the center of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces, and other iron works in the vicinity, has manufactures of ribbons, silks, cutlery, firearms, etc. The collieries alone employ about 16,000 men. Pop. 117.875.

Etive (et′iv), Loch, an inlet of the sea on the west coast of Scotland, in the county of Argyle. The scenery of its shores is very beautiful.

Etna (or Ætna), Mount, the greatest volcano in Europe, a mountain in the province of Catania in Sicily; height 10,874 ft. It rises immediately from the sea, has a circumference of more than 100 mi., and dominates the whole northeast part of Sicily, having a number of towns and villages on its lower slopes. The top is covered with perpetual snow; midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, etc. Etna thus presents the variety of climates common to high mountains in lower latitudes, oranges and lemons and other fruits growing at the foot, the vine rather higher up, then oaks, chestnuts, beeches, and pines, while on the loftiest or desert region vegetation is of quite a stunted character. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by a number of cones, all of volcanic origin, and nearly 100 of which are of considerable size. From the summit the view presents a splendid panorama, embracing the whole of Sicily, the Lipari Islands, Malta, and Calabria. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava

spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. Among more recent eruptions are those of 1832, 1865, 1874, 1879. An eruption is ordinarily preceded by premonitory symptoms of longer or shorter duration. The pop. of the district of Etna is about 300,000.

Etru′ria, (Greek, *Tyrrhenia*), the name anciently given to that part of Italy which corresponded partly with the modern Tuscany, and was bounded by the Mediterranean, the Apennines, the river Magra, and the Tiber. The name of Tusci or Etrusci was used by the Romans to designate the race of people anciently inhabiting this country, but the name by which they called themselves was Rasena (or perhaps more correctly Ta-rasena). Etruria proper was in a flourishing condition before the foundation of Rome, 753 B. C. It was known very early as a confederation of twelve great cities, each of which formed a republic of itself. After a long struggle with Rome the Etruscan power was completely broken by the Romans in a series of victories, from the fall of Veii in 396 B. C. to the battle at the Vadimonian Lake (283 B. C.). The Etruscans had attained a high state of civilization. They carried on a flourishing commerce, and at one time were powerful at sea. They were less warlike than most of the nations around them, and had the custom of hiring mercenaries for their armies.

Etruscan art was in the main borrowed from Greece. For articles in terra cotta, a material which they used mainly for ornamental tiles, sarcophagi, and statues, Etruscans were especially celebrated. In the manufacture of pottery they had made great advances; but most of the painted vases popularly known as Etruscan are undoubtedly productions of Greek workmen.

Etruria, kingdom of, in Italy, founded by Napoleon I in 1801. Its capital was Florence. In 1807 Napoleon incorporated it with the French Empire.

Etruscan Vases, a class of beautiful ancient painted vases made in Etruria, but not strictly speaking a product of Etruscan art, since they were really the productions of a ripe age of Greek art, the workmanship, subjects, style, and inscriptions being all Greek. They are elegant in form and enriched with bands of beautiful foliage and other ornaments, figures and similar subjects of a highly artistic character. One class has black figures and ornaments on a red ground — the natural color of the clay; another has the figures left of the natural color and the ground painted black. The former class belong to a date about 600 B. C., the latter date about a century later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. During this period there was much variety in the form and ornamentation, gold and other colors beside the primitive ones of black and red being frequently made use of in their embellishment.

Etty, William (1787–1849), an English painter. He studied at the Royal Academy. His principal works are: a series of three pictures (1827–31) illustrating the *Deliverance of Bethulia by Judith, Benaiah one of David's Mighty Men, Woman Interceding for the Vanquished.*

Etymol'ogy, a term applied, 1, to that part of grammar which treats of the various inflections and modifications of words, and shows how they are formed from simple roots; 2, to that branch of philology which traces the history of words from their origin to their latest form and meaning. Etymology in this latter sense, or the investigation of the origin and growth of words, is among the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. It was not till recent times, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. It was recognized that the development of language is not an arbitrary or accidental matter, but proceeds according to general laws. The result was a great advance in etymological knowledge and the formation of a new science of philology (which see).

Eubœ'a, formerly called Negropont, a Greek island, the second largest island of the Ægean Sea. It is 90 mi. in length; 30 in greatest breadth, reduced at one point to 4 mi. It is separated from the mainland of Greece by the narrow channels of Egripo and Talanta. It is connected with the Bœotian shore by a bridge. There are several mountain peaks over 2,000 ft. and one over 7,000 ft. The island is well wooded and remarkably fertile. Wine is a staple product, and cotton, wool, pitch, and turpentine are exported. The chief towns are Chalcis and Karysto. With some small islands it forms a modern nomarchy, with a pop. of 95,136.

Eucalyp'tus, a genus of trees, mostly natives of Australia, and remarkable for their gigantic size, some of them attaining the height of 480 or 500 ft. In the Australian colonies they are known by the name of gum-trees, from the gum which exudes from their trunks; and some of them have also such names as "stringy bark," "iron bark," etc. The wood is excellent for shipbuilding and such purposes. The blue gum yields an essential oil which is valuable as a febrifuge, anti-asthmatic, and antispasmodic; the medicinal properties of this tree also make it useful as a disinfectant, and as an astringent in affections of the respiratory passages, being employed in the form of an infusion, a decoction, or an extract, and cigarettes made of the leaves being also smoked. *E. globŭlus* and the *E. amygdalina* are found to have an excellent sanitary effect when planted in malarious districts such as the Roman Campagna, parts of which have already been reclaimed by their use. This result is partly brought about by the drainage of

the soil (the trees absorbing great quantities of moisture), partly perhaps by the balsamic

Eucalyptus.

odor given out. *E. mannifera* and others yield a sweet secretion resembling manna.

Euclid (Eucleides), of Alexandria, a distinguished Greek mathematician, who flourished about 300 B. C. His *Elements of Geometry* in thirteen books are still extant, and form the most usual introduction to the study of geometry. The severity and accuracy of his methods of demonstration have as a whole never been surpassed. Besides the *Elements*, some other works are attributed to Euclid.

Eudiom'eter, an instrument originally designed for ascertaining the purity of the air or the quantity of oxygen it contains, but now employed generally in the analysis of gaseous mixtures. It consists of a graduated glass tube, either straight or bent in the shape of the letter U, hermetically sealed at one end and open at the other. Two platinum wires, intended for the conveyance of electric sparks through any mixture of gases, are inserted through the glass near the closed end of the tube, and approach but do not touch each other. The electric spark causes chemical combination to take place between the oxygen in the gas to be analyzed, and hydrogen which has been introduced into the tube, and the nature and proportion of the constituents of gaseous mixture are determined by the diminution in volume after the passing of the spark. Certain substances, such as caustic, potash, pyrogallic acid, etc., may be introduced into the closed tube in order to absorb the gases present one by one.

Eufala, Barbour co., Ala., on Chattahoochee River, 80 mi. s.e. of Montgomery. Railroads: Montgomery & Eufala; Eufala & Ozark; and South Western. Industries: two cotton mills, carriage factory, planing mills, and canning factory. Surrounding country agricultural. Pop. 1900, 4,532.

Eugene (ū-jēn') (or François Eugène) (1663–1736), Prince of Savoy, fifth son of Eugène

Maurice, duke of Savoy-Carignan, and Olympia Mencini, a niece of Cardinal Mazarin, was born at Paris. Offended with Louis XIV he entered the Austrian service in 1683, serving his first campaign as a volunteer against the Turks. At the end of the war he was sent as commander-in-chief to Hungary. The Spanish War of Succession brought Eugene again into the field. In 1703 he commanded the imperial army in Germany, and in co-operation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstadt, or Blenheim, Eugene and Marlborough defeated the French and Bavarians under Marshal Tallard, Aug. 13, 1704. Next year Eugene, returning to Italy, forced the French to raise the siege of Turin, and in one month drove them out of Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. After the recall of Marlborough, which Eugene opposed in person at London without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked. In the war with Turkey, in 1716, Eugene defeated two superior armies at Peterwaraden and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. During fifteen years of peace which followed, Eugene served Austria as faithfully in the cabinet as he had done in the field. He died in Vienna. He was one of the great generals of modern times.

Eugénie (eu-zhā-nē), Marie de Guzman, ex-empress of the French, b. at Granada, in Spain, in 1826. Her father, the Count de Montijo, was of a noble Spanish family; her mother was of Scotch extraction, maiden name Kirkpatrick. On Jan. 29, 1853, she became the wife of Napoleon III and empress of the French. On March 16, 1856, a son was born of the marriage. When the war broke out with Germany she was appointed regent (July 27, 1870) during the absence of the emperor, but on September 4 the revolution forced her to flee from France. She went to England, where she was joined by the prince imperial and afterward by the emperor. Camden House, Chiselhurst, became the residence of the imperial exiles. On Jan. 9, 1873, the emperor died, and six years later the prince imperial was slain while serving with the English army in Africa, in the Zulu War. In 1881 the empress transferred her residence to Farnborough, in Hampshire.

Eulenspiegel (oi'len-spē-gl), Till, a name which has become associated in Germany with all sorts of wild, whimsical frolics, and with many amusing stories. Some such popular hero of tradition and folk-lore seems to have really existed in Germany, probably in the first half of the fourteenth century, and a collection of popular tales of a frolicsome character, originally written in Low German, purports to contain his adventures.

Eupato'rium, a genus of plants chiefly natives of America, belonging to the natural order Compositæ. Their roots are perennial, possessing a rough, bitter or aromatic taste; the flowers are small, white, reddish, or bluish, in corymbs.

Hemp Agrimony.

Eupho'nium, a brass bass instrument, generally introduced into military bands, and frequently met with in the orchestra as a substitute for the bass trombone, from which, however, it is very different in tone. It is tuned on C or on B flat, and is furnished with three or four valves or pistons.

Euphorbia'ceæ, the spurgeworts, a natural order of herbaceous plants, shrubs, or very

Caper Spurge.

large trees, which occur in all regions of the globe. Most of them have an acrid, milky juice, and diclinous or monœcious flowers. The fruit is dry or slightly fleshy, and three-lobed.

Euphra'tes (or El Frat), a celebrated river of Western Asia, in Asiatic Turkey, having a double source in two streams rising in the Anti-Taurus Range. Its total length is about 1,750 mi., and the area of its basin 260,000 sq. mi. It flows mainly in a southeasterly course through the great alluvial plains of Babylonia and Chaldæa till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 mi. from its mouth it is joined by the Tigris, when the

united streams take the name of Shatt-el-Arab. It is navigable for about 1,200 mi., but navigation is somewhat impeded by rapids and shallows. The melting of snow in the Taurus and Anti-Taurus causes a flooding in spring. The water is highest in May and June, when the current, which rarely exceeds 3 mi. an hour, rises to 5 mi. an hour.

Eu′phuism, an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The name and the style were derived from the *Euphues, the Anatomy of Wit* (about 1580), and the *Euphues and his England* (about 1582), of John Lyly.

Eura′sians (syncopated from Europ-Asians), a name sometimes given to the "half-castes" of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras, and Bombay. They generally receive a European education, and the young men are often engaged in government or mercantile offices. The girls in spite of their dark tint are generally very pretty, and often marry Europeans.

Eure (*eur*), a river of n.w. France, which rises in the department of the Orne, and falls into the Seine after a course of 124 mi., being navigable for about half the distance. It gives its name to a department in the n.w. of France, forming part of Normandy; area 2,300 sq. mi. Apples, pears, plums, and cherries form important crops, and a little wine is produced. The mining and manufacturing industries are extensive, and the department has a considerable trade in woolen cloth, linen and cotton fabrics, carpets, leather, paper, glass. Evreux is the capital. Pop. 358,829.

Eure-et-Loir (*eur*-ĕ-lwär), a department in the n.w. of France, forming part of the old provinces of Orléannais and Ile-de-France; area 2,267 sq. mi. A considerable portion is occupied by orchards and vineyards, but the greater part is devoted to cereal crops. The department is essentially agricultural, and has few manufactures. The capital is Chartres. Pop. 283,719.

Eure′ka ("I have found it"), the exclamation of Archimedes, when, after long study, he discovered a method of detecting the amount of alloy in King Hiero's crown. Hence the word is used as an expression of triumph at a discovery or supposed discovery.

Eureka, Humboldt co., Cal., on Humboldt Bay, 225 mi. n. of San Francisco. Railroads: E. R. & E.; K. & E.; E. & M. R. Industries: lumber and shingle mills, two iron foundries, tannery, sash and door, and farm implement factories. Surrounding country agricultural and grazing. The town was first settled in 1850, and became a city in 1870. Pop. 1900, 7,327.

Eurip′ides (-dēz) (B. C. 485–406), a celebrated Athenian tragedian. He studied under Prodicus and Anaxagoras, and is said to have begun to write tragedies at the age of eighteen, although his first published play, the *Peliades*, appeared only in 455 B. C. He was not successful in gaining the first prize till the year 441 B. C., and he continued to exhibit till 408 B. C., when he exhibited the *Orestes.* According to a tradition he was killed by hounds. Euripides is a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the artistic completeness and the sublime earnestness that characterize Æschylus and Sophocles. Euripides is said to have composed seventy-five, or, according to another authority, ninety-two tragedies. Of these eighteen (or nineteen, including the *Rhesus*) are extant; viz., *Alcestis, Medea, Hippolytus, Hecuba, Heracleidæ, Supplices, Ion, Hercules Furens, Andromache, Troades, Electra, Helena, Iphigenia in Tauris, Orestes, Phœnissæ, Bacchæ, Iphigenia in Aulis, and Cyclops.*

Euro′pa, in Greek mythology, the daughter of Agēnor, king of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed the form of a bull, and swam with his prize to the island of Crete.

Europe, the smallest of the great continents, but the most important in the history of civilization for the last two thousand years. It forms a huge peninsula projecting from Asia, and is bounded on the north by the Arctic Ocean; on the west by the Atlantic Ocean; on the south by the Mediterranean, the Black Sea, and the Caucasus Range; on the east by the Caspian Sea, the Ural River, and the Ural Mountains. The most northerly point on the mainland is Cape Nordkyn, in Lapland, in lat. 71° 6′; the most southerly points are Punta da Tarifa, lat. 36° n., in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates Greece. The most westerly point is Cape Roca, in Portugal, in lon. 9° 28′ w., while Ekaterinburg is in lon. 60° 35′ e. From Cape Matapan to North Cape is a direct distance of 2,400 mi., from Cape St. Vincent to Ekaterinburg n. e. by e., 3,400 mi.; area of the continent about 3,800,000 sq. mi. Great Britain and Ireland, Iceland, Nova Zembla, Corsica, Sardinia, Sicily, Malta, Crete, the Ionian and the Balearic Islands are the chief islands of Europe. The shores are very much indented, giving Europe an immense length of coastline (estimated at nearly 50,000 mi.). The chief seas or arms of the sea are: the White Sea on the north; the North Sea, or German Ocean, on the west, from which branches off the great gulf or inland sea known as the Baltic; the English Channel, between England and France; the Mediterranean, communicating with the Atlantic by the Strait of Gibraltar (at one point only 19 mi. wide); the Adriatic and Archipelago, branching off from the Mediterranean; and the Black Sea, connected with the Archipelago through the Hellespont, Sea of Marmora, and Bosphorus.

Surface.—The mountains form several distinct groups or systems of very different geological dates, the loftiest mountain masses being in the south central region. The Scandinavian mountains in the northwest, to which the great northern peninsula owes its form,

Europe

extend above 900 mi. from the Polar Sea to the south point of Norway. The highest summits are about 8,000 ft. The Alps, the highest mountains in Europe (unless Mount Elbruz in the Caucasus is claimed as European), extend from the Mediterranean first in a northerly and then in an easterly direction, and attain their greatest elevation in Mont Blanc (15,781 ft.), Monte Rosa, and other summits. Branching off from the Alps, though not geologically connected with them, are the Apennines, which run southeast through Italy, constituting the central ridge of the peninsula. The highest summit is Monte Corno (9,541 ft.). Mount Vesuvius, the celebrated volcano in the south of the peninsula, is quite distinct from the Apennines. By southeastern extensions the Alps are connected with the Balkan and the Despoto-Dagh of the southeastern peninsula of Europe. Among the mountains of Southwestern Europe are several massive chains, the loftiest summits being in the Pyrenees, and in the Sierra Nevada in the south of the Iberian Peninsula. The highest point in the former, La Maladetta, or Mont Maudit, has an elevation of 11,165 ft.; Mulahacen, in the latter, is 11,703 ft., and capped by perpetual snow. West and northwest of the Alps are the Cevennes, Jura, and Vosges; north and northeast, the Harz, the Thüringerwald Mountains, the Fichtelgebirge, the Erzgebirge, and Böhmerwaldgebirge. Further to the east the Carpathian chain encloses the great plain of Hungary, attaining an elevation of 8,000 or 8,500 ft. The Ural Mountains between Europe and Asia reach the height of 5,540 ft. Besides Vesuvius, two other volcanoes are Etna in Sicily, and Hecla in Iceland. A great part of northern and eastern Europe is level. The *great plain* of North Europe occupies part of France, Western and Northern Belgium, Holland, the northern provinces of Germany, and the greater part of Russia. A large portion of this plain, extending through Holland and North Germany, is a low sandy level protected from inroads of the sea only by means of strong dikes. The other great plains of Europe are the plain of Lombardy (the most fertile district in Europe) and the plain of Hungary. Part of Southern and Southeastern Russia consists of steppes.

Rivers and Lakes.—The main European watershed runs in a winding direction from southwest to northeast, at its northeastern extremity, being of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone, and the Po, while the Danube, a still greater stream, rises in the Black Forest north of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1,700 mi. including windings 2,400 miles. Into the Mediterranean, flow the Ebro, the Rhone, and the Po; into the Black Sea, the Danube, Dnieper, Dniester, and Don (through the Sea of Azov); into the Atlantic, the Guadalquivir, the Guadiana, the Tagus, and Loire; into the English Channel, the Seine; into the North Sea, the Rhine, Elbe; into the Baltic, the Oder, the Vistula, and the Duna; into the Arctic Ocean the Dwina. The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the north side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich, and Constance; on the south side, Lago Maggiore, and the lakes of Como, Lugano, Iseo, and Garda. The northern lakes extend across Sweden from west to east, and on the east side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found—Lakes Ladoga and Onega.

Geology.—The geological features of Europe are exceedingly varied. The older formations prevail in the northern part as compared with the southern half and the middle region. North of the latitude of Edinburgh and Moscow there is very little of the surface of more recent origin than the strata of the Upper Jura belonging to the Mesozoic period, and there are vast tracts occupied either by eruptive rocks or one or other of the older sedimentary formations. Denmark and the portions of Germany adjoining belong to the Cretaceous period, as does also a large part of Russia between the Volga and the basin of the Dnieper. Middle and Eastern Germany, with Poland and the valley of the Dnieper present on the surface Eocene formations of the Tertiary period. The remainder of Europe is remarkable for the great diversity of its superficial structure, rocks and deposits belonging to all periods being found within it, and having for the most part no great superficial extent. Europe possesses abundant stores of those minerals which are of most importance to man, such as coal and iron, Britain being particularly favored in this respect. Coal and iron are also obtained in France, Belgium, and Germany. Gold is found to an unimportant extent, and silver is widely spread in small quantities. The richest silver ores are in Norway, Spain, the Erzgebirge, and the Harz Mountains. Spain is also rich in quicksilver. Copper ores are abundant in the Ural Mountains, Thuringia, Cornwall, and Spain. Tin ores are found in Cornwall, the Erzgebirge, and Brittany.

Climate.—Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone, and the great extent of its maritime boundaries. Much benefit is also derived from the fact that its shores are exposed to the warm marine currents and warm winds from the southwest, which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the lines of equal mean temperature decline south as we go east. The same advantages of mild and genial temperature which Western has over Eastern

Pine-cone and Chesnut

Chesnut-tree.

Fruit of the Locust-tree.

Teazle

Iceland Moss

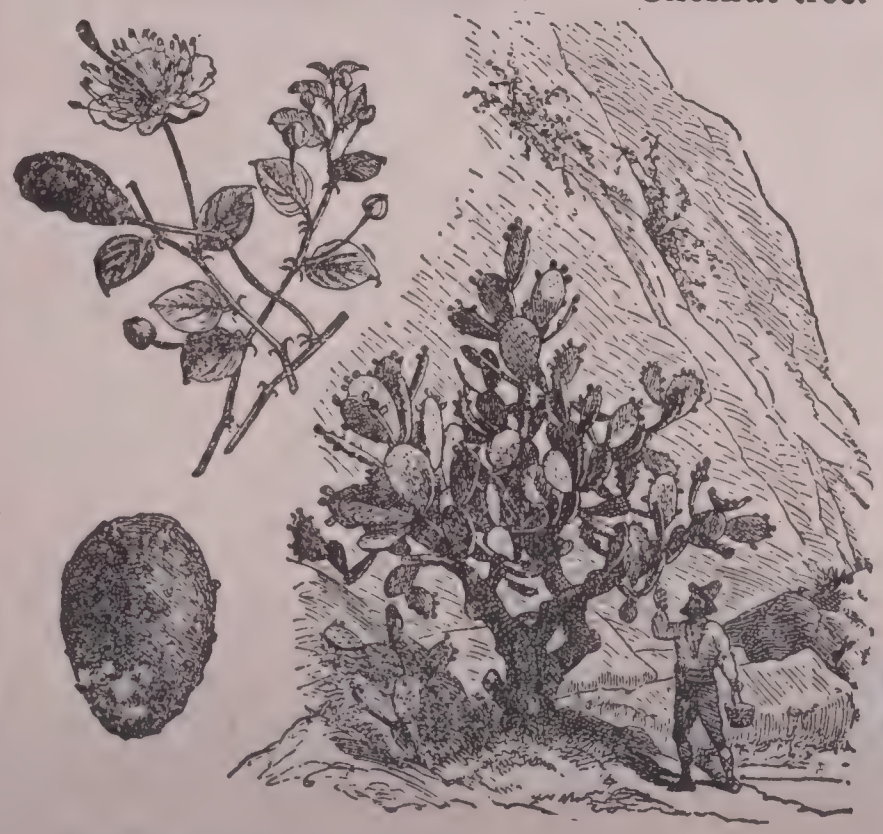


Fig Cactus or Prickly Pear

Caper Shrub

Mastic-tree

Cypress

Olive-tree

Edelweiss

Alpine Rose

Safflower

Saffron

Dwarf Birch

Madder Plant

Glasswort

Reindeer Moss

Orange-tree

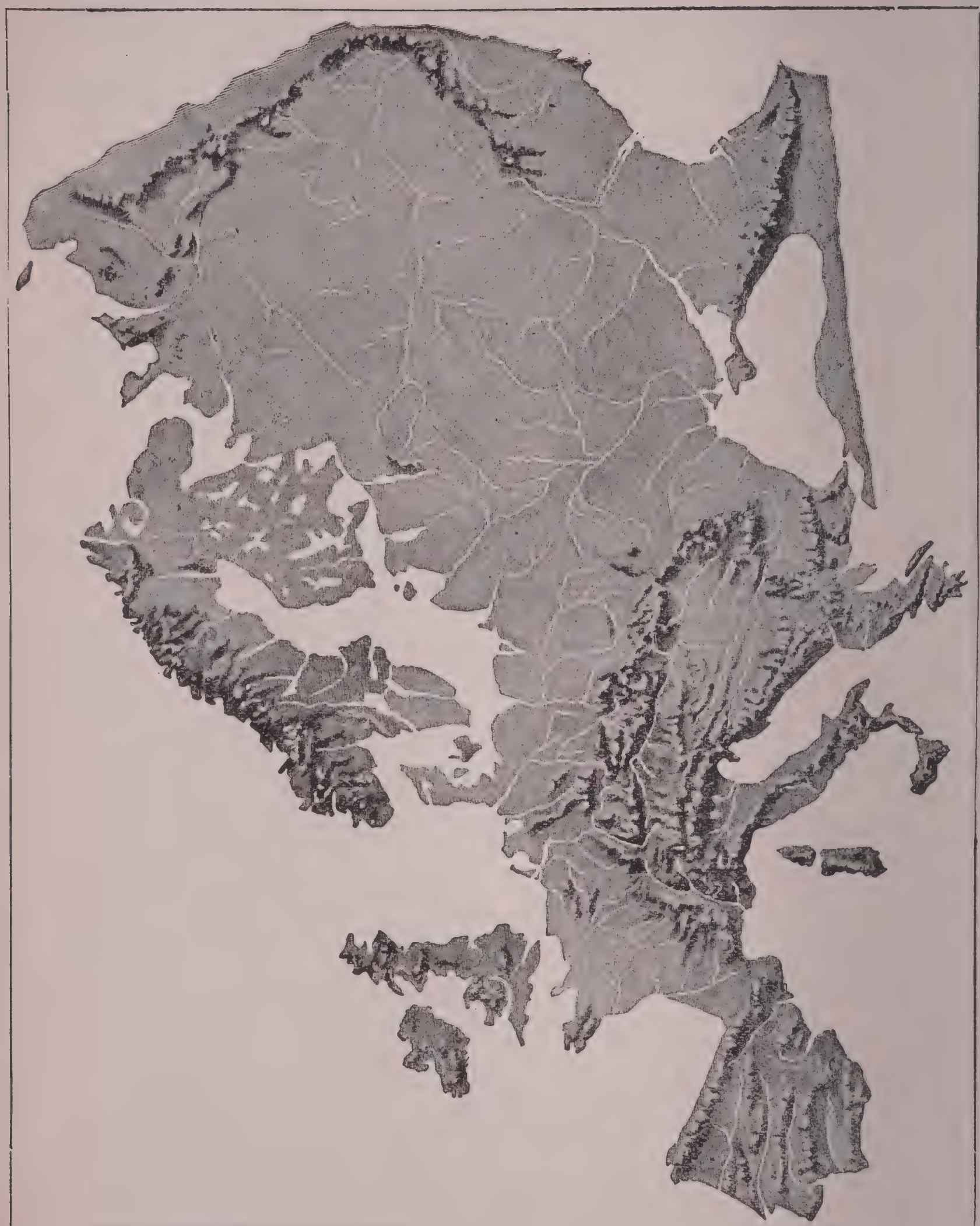
Pomegranate-tree

Fig-tree

Myrtle

Laurel

Pine-tree



Longitude from 35° Greenwich. 30° 25° 20° 15° 10° 5° 0° 5° 10°

ARCTIC OCEAN

Horn (N. Cape)

ICELAND

REYKJAVIK

HEKLA

Arctic Circle

ATLANTIC OCEAN

FAROE ISLANDS

SHETLAND ISLANDS

NORWEGIAN SEA

LOFODEN ISLANDS

West Fiord

Trondhjem

Hardanger Fiord

Bergen

Stavanger

Christiansand

The Naze

Skager Rack

Kattegat

Thisted

Aarhus

Varberg

Lake Wener

Lake Wetter

GOTHLAND

Karlscron

Jonkoping

Norrkoping

Drammen

CHRISTIANIA

Geste

Upsa

HEBRIDES

ORKNEY ISLANDS

Munch

The Skye

Moray Firth

GRAMPIAN MTS.

SCOTLAND

Aberdeen

Perth

Dundee

Leith

Firth of Forth

Greenock

Edinburgh

Glasgow

Londonderry

Sligo

Bellast

Dumfries

Newcastle

Lancaster

Leeds

York

Hull

Sheffield

Liverpool

IRELAND

Dublin

Manchester

IRISH SEA

Limerick

Waterford

Cork

Cape Clear

Land's End

Lizard Pt.

ENGLISH CHANNEL

ST. GEORGE'S CHANNEL

Swansea

Bristol

Plymouth

Southampton

Portsmouth

Dover

I. of Wight

ENGLAND

LONDON

THE HAGUE

NETHERLANDS

Ghent

BELGIUM

Brussels

Antwerp

Cherbourg

Le Havre

Boulogne

Amiens

Rouen

Caen

Brest

Seine

Versailles

PARIS

Chalons

Nancy

Metz

Luxemburg

Frankfort

Coburg

Gotha

Leipzig

Dresden

SAXONY

Prague

Cologne

Dusseldorf

Munster

Hanover

Bremen

Oldenburg

Hamburg

Lauenburg

Stettin

Brunswick

Magdeburg

Elbe

Potsdam

BERLIN

Posen

Bromberg

Koslin

Danzig

Gluga

Lannes

Loire

Nantes

Angers

Orleans

Troyes

Tours

Bourges

Dijon

Saone

Marne

Meuse

Moselle

Rhine

Nurnberg

Carlsruhe

Baden

Stuttgart

Ratisbon

Pilsen

Tabor

Budweis

Linz

VIENNA

Graiz

Buaa or O

Balaton

Basle

Zurich

Innstruck

Strassburg

Ulm

Munich

BAVARIA

Salzburg

BERN

SWITZERLAND

Geneva

Lyon

Grenoble

Limoges

AUVERGNE MTS.

Tulle

Angoulême

Bordeaux

Garonne

Cahors

Montauban

Toulouse

Tarbes

Pau

Pyrenees

Rhone

Cevennes

Avignon

Marseille

Nice

Toulon

Gulf of Lions

Montpellier

Gulf of Genoa

Lughart

Siena

Florence

Ancona

Bologna

Modena

Parma

Turin

Milan

Mantua

Venice

Trieste

Trient

Klagenfurth

Grätz

Buaa or O

Balaton

Raguza

Barletta

Naples

MT. VESUVIUS

Tarento

Gulf of Tarento

Cape Bon

Tunis

Bona

Algiers

Oran

Cape St. Vincent

Strait of Gibraltar

Cadiz

Seville

Cordova

Guadalquiver

Granada

Malaga

Gibraltar

SA. NEVADA

SA. MORENA

SA. DE TOLEDO

Toledo

Madrid

Guadiana

Tagus

Douro

Salamanca

Valladolid

Ebro

Pamplona

Vittoria

Santiago

Oviedo

Coruna

C. Finisterre

C. Ortegal

BAY OF BISCAY

CANTABRIAN MTS.

Braga

Minho R.

Oporto

Coimbra

Lisbon

Setuba

Beja

Valencia

Alicante

Murcia

Cartagena

Zaragoza

Lerida

ANDORRA MTS.

Tortosa

Barcelona

Balearic Isles

Minorca

Majorca

Sassari

Corsica

Elba

Ajaccio

Civitavecchia

Tiber R.

Rome

Cagliari

Sardinia

Tyrrhenian Sea

G. of Salerno

Policastro

Palermo

Lipari Is.

Messina

Mt. Aetna

Sicily

Catania

Syracuse

Malta

Tunis

Bona

Algiers

Oran

Morocco

Algeria

Portugal

Spain

France

Switzerland

Germany

Denmark

Copenhagen

Malmo

Flensborg

Kiel

Altona

Stralsund

Rugen

Bornholm

Gulf of Bothnia

Baltic Sea

Adriatic Sea

Apennines

Mediterranean Sea

Africa

Europe

Rand, McNally & Co. Engr's, Chicago.

0° 5° 10° 15° Longitude

EUROPE.

SCALE OF MILES.

100 50 0 100 200 300 400

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Europe, the continent collectively has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go east. Peking, in lat. 40° n., has as severe a winter as St. Petersburg in lat. 60°.

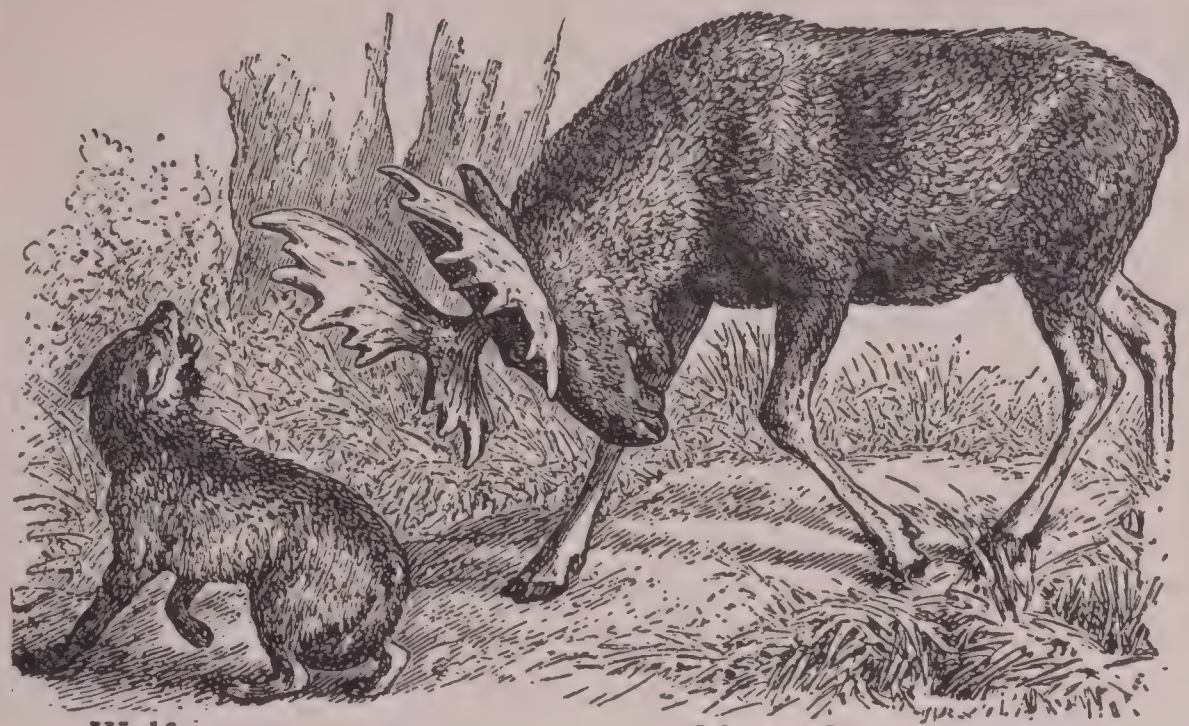
Vegetable Productions.—With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree farther south. The cultivation of grain extends farther north than might be supposed. Barely ripens even under the 70th parallel of north latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from lat. 64° in Norway to lat. 62° in Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of Southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the continent, gives way to wheat, and in the southern portion of it to maize also. The fourth zone, comprehending the southern peninsulas, is that of the olive and evergreen woods. The orange flourishes in the southern portion of it, and rice is cultivated in a few spots in Italy and Spain.

Animals.—As regards animals the reindeer and polar bears are peculiar to the north. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod, and salmon.

Inhabitants.—Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the west of Europe from the Alps to the British Islands. But the Celtic nationalities were broken by the wave of Roman conquest, and the succeeding invasions of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in some parts of Ireland (Irish), in Wales (Cymric), and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch, and the English. The Scandinavians are divided into Danes, Swedes, and Norwegians. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs, or Bohemians, the Servians, Croatians, etc. In the south and southeast of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish, and Portuguese. All the above peoples are regarded as belonging to the Indo-European or Aryan stock. To the Mongolian stock belong the Turks, Finns, Lapps, and Magyars, or Hungarians, all immigrants into Europe in comparatively recent times. The Basques, at the western extremity of the Pyrenees, are a people whose affinities have not been determined. The total population of Europe is about 330,000,000; nine tenths speak the languages of the Indo-European family, the Teutonic group numbering about 108,000,000, the Slavonic and Latin over 95,000,000 each. The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Anglican, Baptists, Methodists, etc.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion.

Political Divisions.—The states of Europe are as follows; Austria–Hungary, Liechtenstein, Bosnia, Herzegovina, etc.; Belgium; Denmark, Faroe, and Iceland; France; Germany; Britain; Greece; Netherlands, Luxemburg; Italy; Montenegro; Portugal; Roumania; Russia; Servia; Spain; Sweden; Norway; Switzerland; Turkey, Bulgaria, Eastern Roumelia.

History.—Europe was probably first peopled from Asia, but at what date we know not. The first authentic history begins in Greece at about 776 B.C. Greek civilization was at its most flourishing period about 430 B.C. After Greece came Rome, which, by the early part of the Christian era, had conquered Spain, Greece, Gaul, Helvetia, Germany between the Danube and the Alps, Illyria, Dacia, etc. Improved laws and superior arts of life spread with the Roman empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the universal migration of the northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. Under Charlemagne (771–814) a great Germanic empire was established, so extensive that the kingdoms of France, Germany, Italy, Burgundy, Lorraine, and Navarre were afterward formed out of it. About this time the northern and eastern nations of Europe began to exert an influence in the affairs of Europe. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and



Wolf

Moose Deer

Lemmings

Reindeer

Glutton

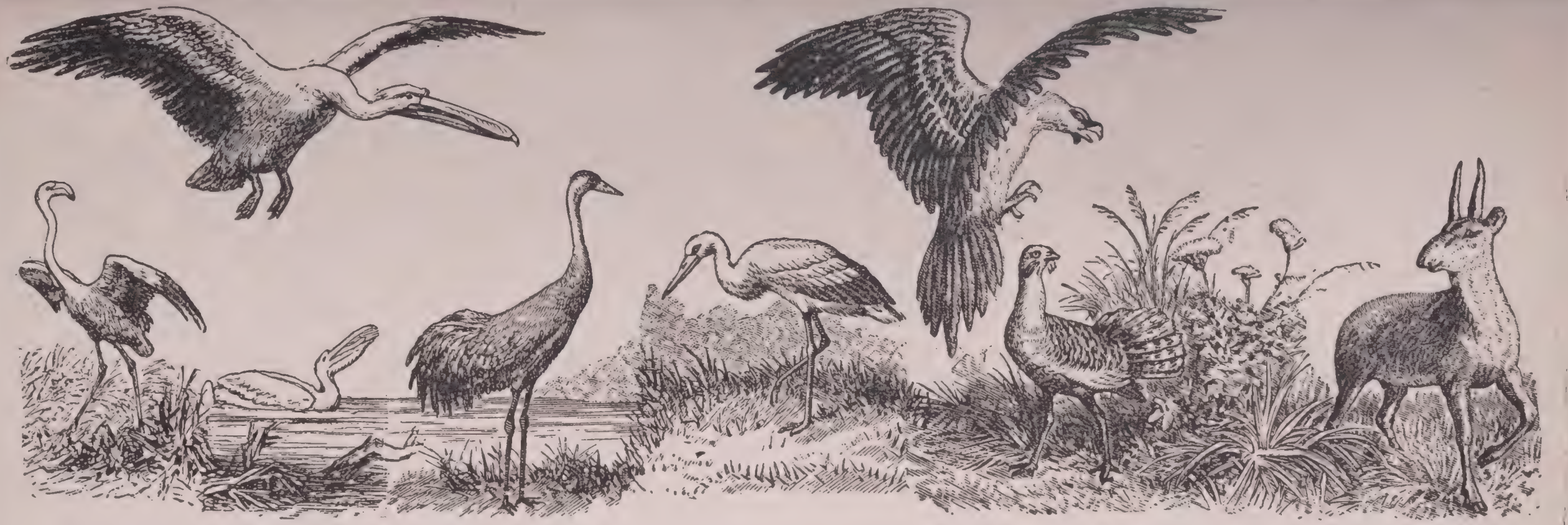
Aurochs

Brown Bear

Buffalo

Porcupine

Barbary Ape



Flamingo Pelican Crane Stork Bearded Vulture Bustard Saiga Antelope

Seagull Eider Duck Seal Sturgeon

principalities in England, France, Sicily, and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the twelfth to the fifteenth century. The conquest of Constantinople by the Turks (1453) by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onward by the invention of printing, and the Reformation. The discovery of America was followed by the temporary preponderance of Spain in Europe, and next of France. Subsequently Prussia and Russia gradually increased in territory and strength. The French Revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the unification of Italy under Victor Emmanuel; the Franco–German War, resulting in the consolidation of Germany into an empire under the leadership of Prussia; the partial dismemberment of the Turkish Empire, and the war between Turkey and Greece (1897).

Eurydice (ū-rid′i-sē), in Greek mythology, the wife of Orpheus.

Eustis, James Biddle, soldier and statesman, b. 1834 in New Orleans, La. He graduated at Harvard Law School in 1854 and practised law until the war broke out. He served on the staff of Gen. J. E. Johnson till the close of the war. He was elected a member of the state legislature in 1872 and served in the U. S. Senate 1877–1879. He was again elected senator in 1884. President Cleveland appointed him minister to France. Died Sept. 9, 1899.

Euter′pe, 1, one of the Muses, considered as presiding over lyric poetry, the invention of the flute being ascribed to her. She is usually represented as a virgin crowned with flowers, having a flute in her hand. 2, In botany, a genus of palms, natives of South America, sometimes nearly 100 ft. in height.

Ev′ans, Oliver (1755–1819), b. in Newport, Del., was the inventor of the automatic flour mill and the high-pressure steam engine. He is also said to have invented the first steam road carriage ever worked in America.

Evanston, a suburb of Chicago, Cook co., Ill., situated 12 mi. n. of Chicago, on Lake Michigan. Railroads: Chicago & Northwestern, and Chicago, Milwaukee & St. Paul. It has good streets and many fine residences, also numerous churches, a city hall, and waterworks. The Northwestern University, the Garrett Biblical Institute, a college for young women, and other educational institutions are located here. Evanston is connected with Chicago by an electric street railroad. Pop. 1900, 19,259.

Evansville, Vanderburg co., Ind., on Ohio River, 163 mi. n.e. of St. Louis. Railroads: E. & T. H.; E. & I.; E. & R.; P. D. & E.; L. E. & St. L.; L. & N.; O. V.; L. H. & St. L.; E. S. &. N.; E. belt line. Industries: cotton mill, seven flouring mills, thirteen iron foundries, twenty-four furniture factories, three

breweries, three sawmills, and a number of other industries. The town was first settled in 1812 by Hugh McGary and became a city in 1847, named after General Evans. Pop. 1900, 59,007.

Evaporation, the conversion of a liquid or solid by heat into vapor or steam, which becomes dissipated in the atmosphere in the manner of an elastic fluid. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea, of lakes, rivers, and pools. The vapor thus formed, being specifically lighter than atmospheric air, rises to considerable heights above the earth's surface; and afterward, by a partial condensation, forms clouds, and finally descends in rain.

Evarts, Wm. M., was b. in Boston, Feb. 6, 1818; graduated at Yale (1837), studied law at Harvard and was admitted to the bar in New York city in 1841. He was assistant district attorney in New York City from 1849 to 1853. In 1868 was counsel for President Johnson in the impeachment trial. In 1872 was counsel for the U. S. in the Alabama claims. His fees have amounted to $50,000 for a single opinion. He served as secretary of state under President Hayes. He was elected to the U. S. senate in 1885, serving until 1891. He died Feb. 28, 1901.

Evening-star (or Hesperus), the name given to the planet Venus when visible in the evening. See *Venus.*

Ev′erett, Alexander Hill (1792–1847), an American diplomatist. After studying at Harvard, in 1809 he accompanied John Quincy Adams to St. Petersburg as secretary of legation. He afterward filled successive diplomatic posts in the Netherlands, Spain, and elsewhere. He is the author, among other works, of *Europe, or a General Survey of the Present Situation of the Principal Powers* (1822); and a similar work on America.

Everett, Edward (1794–1865), an American statesman and author, brother of the preceding. After traveling for some years in Germany and England he returned to America in 1819 to occupy the chair of Greek literature at Harvard. He became editor of the *North American Review*, and entering the political world became successively member of Congress, governor of Massachusetts, and minister plenipotentiary in England (1840). In 1845 he was appointed president of Harvard College, and in 1852 secretary of state. Shortly after he retired into private life.

Everett, Middlesex co., Mass., on Charles and Malden rivers. Railroad, Boston & Maine. Industries: chemical works, iron foundry, furniture, shoe, bicycle, glove, pickle, lead, and varnish factories. Oil in vicinity. The town was first settled in 1634 as a part of Malden, incorporated as a town in 1870 and became a city in 1893. Pop. 1900, 24,336.

Everglades, a low marshy tract of country in Southern Florida, inundated with water and interspersed with patches or portions covered with high grass and trees. They are 160 mi. long and 60 broad.

Evergreen, a plant that retains its verdure through all the seasons, as the fir, the holly, the laurel, the cedar, the cypress, the juniper, the holm-oak, and many others. Evergreens shed their old leaves in the spring or summer, after the new foliage has been formed, and consequently are verdant through all the winter season. They form a considerable part of the shrubs commonly cultivated in gardens, and are beautiful at all seasons of the year.

Everlasting-flower.

Everlasting-flowers, a name applied to certain plants which, when dried, suffer little change in their appearance. The plants to which this name is peculiarly applied belong to the genus *Helichrysum*, but it is also given to members of allied genera, such as *Antennaria*, *Gnaphalium*, etc.

Evolution.—Upon every developing mind, whether infantile or consciously philosophic, there presses at times the question of the origin of things. The attempt to answer this is to construct a cosmogony; and is alike the earliest and latest extension of our common-sense account of things into complete and more orderly form as science. This philosophy of things is not only incapable of being grasped by the highest effort of the intellect, but is incessantly contradicted by experience; it has hence never gained any real acceptance from the simplest common sense, much less any confirmation from science. The alternative then arises of drawing an explanation of the origin of things from our experience not of permanence, but of change. Here it is naturally the most changeful phenomena, the most marked and sudden contrasts, which first and most deeply arouse our attention, and this not only in nature, but still more in human life and affairs. The hypothesis of a sudden and unexplained, of a mysterious appearance or creation of things, thus next presents itself; and the subsequent explanation of this as an act of external will is rendered easy by our personal consciousness. Phenomena are becoming classified and interconnected in larger and larger groups, with which a higher anthropomorphism can henceforth associate a conception of detailed design. The older view only remains provisionally so far as order is not yet apparent. Human affairs become more and more obviously interpretable than of old, and there arises in their place the characteristically modern ideas of progress. Natural science has become meanwhile more active, the very astronomical and geological phenomena from which our ideas of permanence were most derived are seen to be in process of change. The idea of the present as the product of the past also becomes extended to the

world of organic life. The details, the general mechanism and direction of the processes of change, thus become inquiries of paramount interest. It is admitted on all hands that the evolution theory only supersedes those cruder anthropomorphisms of arbitrary creation and of mechanical contrivance which presented the universe as a mere aggregate of finished products, without excluding that higher and more unified teleology which interprets it as the orderly unfolding of a cosmic drama.

Evolution in the Physical Sciences—Astronomy. Here, as in other sciences, early conceptions of the universe agree in viewing it as being, as far as possible, in permanence and at rest, and not in change and motion. Such static views may be only tacitly implied, but are more usually directly avowed: thus the earth was long viewed as a plane stably supported, and until very recently the stars were viewed as fixed. But as the static universe of the ancient astronomer passed into that of Copernicus and Kepler, Galileo and Newton, Herschel and Leverrier, dynamic, or more accurately kinetic, conceptions have henceforward an assured prominence in at least one science, and that the one most obviously concerned with the universe as a whole. For although evolutionary speculations of more or less vagueness seem to have arisen once and again in almost every science, the first well-developed theory of evolution which has attempted to cope with the observed facts of any science must be credited to astronomy in the famous *Nebular Hypothesis*, of which the suggestiveness to all other departments of science must be freely admitted. For the mind which has once fully grasped the conception of stellar and planetary evolution cannot readily stop there.

Evolution in Geology.—That the last century mineralogist was here and there already widening his interest to the rocks and even meditating as to their nature and origin is well evidenced by the penetrating speculation of Linnæus: "It may be that the solid rocks are not primeval, but the daughters of time." As subsequent generations of research have shown us, this solid rock is the product of igneous and that of aqueous action, here reaching back to an incalculable antiquity, or there evolved within the period of human occupancy; while others consist in great part, or even completely, of the remains of extinct animals or plants. These are conceptions now so familiar that it is difficult to realize their once revolutionary appearance and effect. More detailed studies, too, would be of no little service to our general theories; note, for instance, how the geologist takes from the astronomer, now a stellar evolutionist, the cooling planet, and outlines its primeval surroundings of land and sea, its wrinkling hills and vales, how he proves that the pulse of the ocean is but the dying ripple of a once fiftyfold mightier tidal wave, or how the glacial period is the inexorably recurrent winter of a year of ages. The mineralogist no longer merely measures and analyzes, but deciphers the origin and transmutation of min-

eral species, and of the rocks they form under the forces of the environment; and the typically changeful phenomena of climate and atmosphere are rendered the subject of a typically dynamic sub-science.

Modal Explanation of Physical Evolution.—We must sooner or later inquire whether any general principle can be found to verify and rationalize the process of evolution in the physical world, and to this the answer has been specially elaborated by Herbert Spencer. His essential principle, or *Law of Evolution*, must be stated in his own words: "Evolution is an integration of matter and concomitant dissipation of motion during which the matter passes from an indefinite, incoherent heterogeneity to a definite, coherent homogeneity, and during which the retained motion undergoes a parallel transformation." And although the student who seeks to follow Mr. Spencer in grappling with the riddle of evolution in higher orders of phenomena may not admit that his uncompromising applications of the principles of physical evolution to higher categories is so exhaustive and satisfactory as he claims, there can be no doubt that his general treatment has been on the whole amply justified, so far as it goes, alike in unifying the sciences, and in the separate organization of these.

Evolution in Biology.—This portion of the subject demands special attention and fullest outline for many reasons. Not only is the transition from static to evolutionary conceptions of comparatively recent, indeed almost contemporary interest; but the progress of the doctrine of evolution as a general theory of the universe has been most closely connected with progress in biology. And while we can at best merely speculate as to the direct continuity of evolution from the inorganic to the organic world, we are constantly impressed by the fundamental unity of the process in the simplest and most complex forms of life, and by the thoroughness with which the same principles may be traced into the highest "superorganic" phenomena of mind and society. The general argument for evolution appended by Darwin to the classic statement of his theory of *Natural Selection in the Origin of Species* has been already summarized under *Darwinian Theory*. Only the briefest reference to these need here be made. We must keep, for instance, in view the conceptions of the actual evolution of the individual which have become systematized in the sub-science of embryology (see *Embryology*). Suffice it, however, here to recall that, although it is in this connection that the term *evolution* first makes its appearance, it is used along with *development*, in a sense diametrically opposed to its present significance, as the mere enlargement and unfolding of a form and structure in all essential respects a perfect miniature of that of the adult.

Without recording or analyzing the various conceptions of species, it is sufficient again to note how the belief in their objective constancy and practical definableness is shaken by

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such facts as 1, that pre-evolutionary systematists differ hopelessly upon the number and limits of the species of all the more variable groups of plants and animals; 2, that the mere numerical increase of the number of specimens in our museums is constantly compelling us to recognize that great numbers, sometimes even scores or hundreds, of "type specimens" of irreproachably described "species" are but so many individual members of a series linked by the most infinitesimal gradations, yet of which the extremes differ by characters of specific, it may be even generic rank. And when, 3, the assumption of the general sterility of hybrids is proved experimentally to be an exaggeration, it becomes, to say the least, increasingly difficult seriously to support the dogma of the constancy of species.

Leaving the general external form with which the species maker is mainly concerned, we must accompany the anatomist through each level of his deepening analyses and comparisons, through organ systems and organs, tissues and cells, to the ultimate protoplasm itself. To realize how fully this analysis results in the demonstration of an unsuspected unity of structure not only between species and genera, but far larger groups, some actual study of the concrete facts is indispensable; as also to appreciate the same beautiful unity of type in individual structures so differentiated as the appendages of a lobster, or the parts of a flower. Yet here again we have an instance of the tenacity of static conceptions; for although it could not be actually denied that the hypothesis of descent from common ancestors at least *might* explain the structural unity observable under classification, as from a simpler ancestor, that observable under the individual structure, the conception of conformity to a purely ideal "archetype," was long maintained. Rudimentary organs, such as the teeth of fœtal whales, were thus explained not as reduced survivals of structures ancestrally useful, but as purely intellectual necessities of this arbitrary "conformity to type." This ingenious revival of Platonic ideas in conjunction with scholastic nominalism could not, however, very long survive the demonstration of the frequent absence of rudiments necessary for archetypal purposes; and the alternative evolutionary explanation has thus inevitably succeeded to its place.

It is much to learn from the taxonomist that his classification of species and genera, even the whole world of plants or animals, assumes the form of a vast genealogical tree; and it is no small confirmation of the evolutionary view to note how every new fossil trove throws some fresh light upon the order in which the branches or branchlets of this tree have historically developed. With all the missing links we can imagine or desire between the modern horse and his simple five-toed ancestor, not to speak of other examples, we have indeed evidence which may well satisfy us of the historic fact of evolution; but this brings us no nearer comprehending the rationale of the process. Leaving the morphological sciences, we must

pass with Darwin to the study of what we may call the higher physiology. Assuming what is known of the functions of the individual, we must note not only the relations of the species unit (in higher forms usually of course the pair), and so familiarize ourselves with the phenomena of reproduction of sex, of heredity and variation, breeding and relation to offspring, the results of intercrossing, the modification by environment, etc., we must also consider the wider relations among the members of the same species, between allied species, and finally between practically unrelated ones, whether here of struggle or there of adaptation. He thus introduces us to this vast and practically new field, and gives us a glimpse of the living, whole nature in that magistral series of volumes, which we may as it were group into a *Vita Naturæ*, complementary to the static *Systema Naturæ*, and no less epoch-making for our day than was that of Linnæus for his.

It is necessary to refer more precisely to the history of opinion both as regards the fact of evolution and the factors in the process. The history of the two questions—of the empirical fact, and of the actual mechanism of evolution—can hardly be separated, though it is of course well known that the former was virtually settled by the demonstrations of Spencer, Darwin, Wallace, Haeckel, and others soon after the middle of this century, while we are still in the midst of keen debate as to the relative importance of the diverse factors. The history of the theory of evolution, so far as the organic world is concerned, is essentially modern; for in spite of vague hints and *a priori* speculations from Empedocles onward, it was not till the eighteenth century that evolution began to be very definitely suggested as a modal explanation of the origin of our fauna and flora, or that inquiry began to be seriously directed to what we now call the etiology of organisms.

What was for so long only a germ idea at length took shape in the mind of Buffon (1749), who sought to show how new conditions evoked new functions, how these in turn reacted upon the structure of the organism, and how, most directly of all, altered climate, food, and other elements of the environment might be the external conditions of internal change, whether for progress or the reverse. Erasmus Darwin (1794), with a truly living conception of nature, emphasized the organism's inherent power of self-improvement, the molding influence of new needs, desires, and exertions, and the indirect action of the environment in evoking these. To Treviranus (1802–31) organisms appeared almost indefinitely plastic, especially, however, under the direct influence of external forces, nor did his analysis of possible factors fail to recognize what Brooks, Weismann, and others have recently elaborated, that the union of diverse sexual elements in fertilization was in itself a foundation of change. Among the philosophers, especially in the minds of those who had been disciplined in physical or historical investigations, the speculations of the ancients were ever taking fresh form, gaining

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moreover in concreteness; witness the contributions of Kant and Herder. In Goethe's epic of evolution the adaptive influence of the environment is clearly recognized, while the misty theories of his contemporary, Oken, chiefly interpret the organic progress in terms of action and reaction between the organism and its surroundings. In France, Geoffroy and Isidore St. Hilaire, father and son, supported the thesis of definite variation under direct environmental influence. And before reaching even the contemporaries of Darwin a complete history would have to take account of the conclusions of many naturalists, such as Von Buch, Von Baer, Schleiden, Naudin, and Wagner. The environmental factor was subsequently recognized with greater clearness and with less exclusiveness by Spencer; while Darwin and Wallace, recognizing some truth in most of the above positions, but believing them wholly insufficient, left the problem of the origin of variations alone, and devoted their strength to establishing the theory of the origin of species by means of natural selection, a view which emphasizes the destructive, or eliminating, and the conservative, or selective, action of the animate and inanimate environment in the struggle for existence.

Even from the above brief sketch of representative conclusions, it will be seen that successive authors accent diverse factors in the evolutionary process; in the view of one the organism has a motor power of variation inherent in its very constitution, or gained by the intermingling of sex elements from which the individual life starts; to another the molding power of changed function, the perfecting influence of exercise, the degenerating nemesis of disuse are all important; while to a third organisms seem to have been hammered from one shape into another by the action of that complex series of external influences which we briefly term the environment. Among modern naturalists we find champions of each of these three positions respectively emphasizing (*a*) the organism itself, (*b*) its function, and (*c*) its environment; a few remain more or less exclusive Natural Selectionists, with or without theories of the origin of the variations which they postulate; while the majority more and more incline to an eclectic but not yet synthetic view, differing chiefly in regard to the relative importance of the various factors recognized.

Modal Explanation of Organic Evolution.—The conception thus reached of the measure of evolution of a species being expressible in terms of the progress of its (*a*) self-maintaining and (*b*) species-maintaining functions is equally capable of statement in biological, psychological, sociological, or indeed also, as moralists are now agreeing, in ethical terms; what are termed egoistic or altruistic actions being respectively self-maintaining or species-maintaining ones, of course at different levels of evolution. Here, then, we have a basis for the required inquiry as to the mechanism of the evolutionary processes. The evolutionist at any rate will not dispute this parallelism be-

tween the non-ethical aspects of organic evolution, nor deny that the results and processes of evolution in their highest manifestations may be of service in elucidating or criticising the similar ones which must be supposed to exist in less developed forms. Hence he would be in some respects even better justified in tracing the evolutionary process down from the highest aspects to the more simple ones, and from the human species to humbler ones, than conversely. A classical statement of the central difficulty, of which the Darwinism and the morals are alike unexceptionable, and the resultant dualism therefore clearly set forth, may be quoted from Huxley: "From the point of view of the naturalist, the world is on about the same level as a gladiator's show. We must say that its governing principle is intellectual, and not moral, that it is a materialized, logical process accompanied by pleasures and pains. Society differs from nature in having a definite moral object. The ethical man tries to escape from his place in the animal world founded on the free development of the principle of non-moral evolution, and to found a kingdom of man, governed upon the principle of moral evolution. For society not only has a moral end, but, in its perfection, social life is embodied morality. But the effort of the ethical man to work to a moral end, by no means abolished, perhaps has hardly modified, the deep-seated organic impulses which impel the natural man to follow his non-moral course." The general drift of the contemporary discussion is beginning to be apparent; all theories and criticisms have hitherto started with the individual as a unit, and the origin and differentiation of the self-maintaining structures and functions as the primary problem; after which the origin and differentiation of reproductive and species regarding processes have been left only a secondary and subsequent place. This method of approach, however natural to the individual thinker, is artificial as respects nature. The corresponding progress in the historic and individual world from sex and family up to tribe or city, nation and race, and ultimately to the conception of humanity itself, also becomes increasingly apparent. Competition and survival of the fittest are never wholly eliminated, but reappear on each new plane to work out the predominance of the higher, the more integrated and associated type. But this service no longer compels us to regard these agencies as the essential mechanism of progress, to the practical exclusion of the associative factor upon which the victory depends. For we see that it is possible to interpret the ideals of ethical progress, through love and sociality, cooperation and sacrifice, not as mere utopias contradicted by experience, but as the highest expressions of the central evolutionary process of the natural world.

Evolution, in mathematics, the process of extracting the roots of numbers or quantities.

Ewell, Benjamin Stoddert (1810–94), American mathematician, b. in Washington, D. C., June 10; graduated at West Point twenty-two

years later and served there until 1836 as professor of mathematics and philosophy. He afterward became professor, successively, at Hampden-Sidney, Washington College, and William and Mary, and of the latter college he was elected president in 1854. He served in the Confederate army until the close of the war, when he was again elected president of William and Mary College. He was made an honorary member of the Royal Historical Society of Great Britain in 1880, and Hobart College conferred upon him the degree of LL.D. in 1874. His brother, Richard Stoddert (1817–1872), b. in Georgetown, D. C., and educated at West Point. He served in the Mexican War and against the Apaches in New Mexico. He entered the Confederate army in 1861, where he was soon made major general. While serving under Jackson he lost a leg in August, 1862, but took command of the second army corps after Jackson's death. He took part in the battles fought at Winchester, at Gettysburg, and in the Wilderness, but was defeated and captured with his whole command by Sheridan, April 6, 1865.

Ewing, Thomas (1789–1871), an American statesman, b. in Va. In 1831 and 1850 was elected to the U. S. Senate. In 1841 appointed secretary of the treasury. He was the first man to hold the office of secretary of the interior, to which office he was appointed by Fillmore in 1849 and which he held until 1850. In the U. S. supreme court ranked among the foremost lawyers of the nation.

Exchange, a place in large commercial towns where merchants, agents, bankers, brokers, and others concerned in commercial affairs meet at certain times for the transaction of business. The institution of exchanges dates from the sixteenth century. They originated in the important trading cities of Italy, Germany, and the Netherlands, from which last-named country they were introduced into England, and from thence to the United States. In some exchanges only a special class of business is transacted. Thus there are stock exchanges, corn exchanges, coal exchanges, cotton exchanges, etc.

Exchange, in commerce, that species of transactions by which the debts of individuals residing at a distance are canceled by order, draft, or bill of exchange, without the transmission of specie. Thus, a merchant in Chicago who owes for $500 worth of goods in New York, gives a bill or order for that amount which can be negotiated through banking agencies or otherwise against similar debts owing by other parties in New York who have payments to make in Chicago. The creditor in New York is thus paid by the debtor in Chicago, and this contrivance obviates the expense and risk of transmitting money. The process of liquidating obligations between different nations is carried on in the same way by an exchange of foreign bills. When all the accounts of one country correspond in value with those of another, so that there is an even balance, the exchange between the countries will be *at par*, that is, the sum for which the bill is drawn in the one country will be the ex-

act value of it in the other. Exchange is said to be *at par* when, for instance, a bill drawn in New York for the payment of £100 sterling in London can be purchased there for £100. If it can be purchased for less, exchange is *under par* and is against London. If the purchaser is obliged to give more, exchange is *above par* and in favor of London. Although the thousand circumstances which incessantly affect the state of debit and credit prevent the ordinary course of exchange from ever being precisely at par, its fluctuations are confined within narrow limits, and if direct exchange is unfavorable between two countries, this can often be obviated by the interposition of bills drawn on other countries where an opposite state of matters prevails.

Exci'to-motor Action, the action of nerves distributed to muscular organs the stimulation of which leads to movement. Thus, irritation of a nerve supplying a muscle will lead to contraction of the muscle by excito-motor action, and irritation of certain nerves distributed to blood-vessels will lead to contraction of the vessel by acting on its muscular coat.

Exe, a river of England which rises in Exmoor, in the county of Somerset, and after a southerly course of about 50 miles falls into the English Channel at Exmouth.

Exec'utive, that branch of the government of a country by which the laws are carried into effect or the enforcement of them superintended. The term is used in distinction from the *legislative* and the *judicial* departments, and includes the supreme magistrate, whether emperor, king, president, or governor, his cabinet or ministers, and a host of minor officials.

Exec'utor, in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the common law, appoint any person of sound mind and discretion, though otherwise under some legal disabilities as to contracting and transacting business in general, such as a married woman or a minor. The duties of executors and of administrators are, in general, the same, the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate. An executor is liable for any loss occurring to the estate through negligence; for paying legatees before all debts are discharged.

Exegesis (-jē'sis), the exposition or interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation is called *exegetics* or *hermeneutics.*

Ex'eter, a city, river-port, and parliamentary and municipal borough of England, in the county of Devon, on the left bank of the Exe, 10 mi. n.w. from its outlet in the English Channel. Among the objects of interest are the cathedral (founded 1112), the remains of the castle of Rougemont, the Guildhall, the Albert Memorial Museum, St. Michael's Church, etc. Exeter has iron foundries, manufactories of agricultural implements, paper mills, etc., and "Honiton" lace is also made. By means of a canal vessels of 300 tons can reach the city. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, by whom it was called *Isca Damnoniorum.* Pop. 37,580.

Exeter College, Oxford, a college, originally called Stapledon Hall, founded in 1314 by Walter de Stapledon, bishop of Exeter, who made a foundation for a rector and twelve fellows. In 1404 Edmund Stafford, bishop of Exeter, added two fellowships and obtained leave to give the college its present name.

Exhibition, INDUSTRIAL, an exhibition of works of industry and art for the purpose of exciting public interest and promoting trade and manufactures. In 1798 an industrial exhibition of the products of French industry was held at Paris, and proved so successful that in 1802, during the consulate of Napoleon, another was held. The beneficial effects of these exhibitions were so obvious that a series of them was held at intervals, the eleventh and last being held at Paris in 1849. In Britain exhibitions of a more or less local nature had been held in Dublin (1829), Manchester, Liverpool, and Birmingham, and annually in London in the premises of the Society of Arts. In 1855 the first French Exposition Universelle was opened in Paris. The buildings were erected in the Champs Elysées, and covered about 24 acres. There were in all about 24,000 exhibitors. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. The second French International Exhibition was opened on April 1, 1867, and closed on November 3. It was erected on the Champ de Mars, and covered about 37 acres. The exhibitors numbered nearly 50,000, the visitors about 10,000,000. A great exhibition was held at Philadelphia in 1876 upon the occasion of the centennial festival of the American Declaration of Independence. It occupied 60 acres, and had nearly 10,000,000 visitors. A third French International Exhibition was held at Paris in 1878, the area occupied amounting in all to 140 acres, the visitors numbering about 17,000,000. A fourth was held in 1889, the latter being partly intended to commemorate the centenary of the French Revolution. One of the features in connection with it is the famous Eiffel Tower of iron, 984 ft. high, and thus more than 400 ft. higher than any other structure. In 1883 a series of exhibitions began at South Kensington, London, where the exhibits were confined to articles having relation to a special department. To this series belonged The Fisheries Exhibition of 1883, the Health Exhibition of 1884, the Exhibition of Inventions in 1885, and the Exhibition of Colonial and Indian products in 1886. This latter was visited by 5,550,749 persons. Besides these Edinburgh had an International Exhibition of Industry, Science, and Arts in 1886, visited by 2,769,632 persons. In 1887 a Royal Jubilee Exhibition of Arts and Manufactures was opened at Man-

chester and visited by 4,765,000 persons. In the following year a great International Exhibition of Industry, Science, and Art was held at Glasgow, and attracted during the season 5,748,379 visitors. In 1892–93 an International Exhibition of majestic proportions was held in Chicago, Ill., to commemorate the 400th anniversary of the discovery of America. See *World's Columbian Exposition.*

Exogenous Plants (eks-oj'e-nus) (or Exogens), those plants whose stems are formed by successive additions to the outside. The exogens are the largest primary class of plants in the vegetable kingdom, and their increase by annual additions of new layers to the outside of their stems, formed in the cambium between the wood and the bark, is a feature in which they differ essentially from endogens, whose wood is formed by successive augmentations from the inside. The concentric circles thus annually formed, distinguishable even in the oldest trees, aid in computing the age of the tree. The stem and branches also exhibit a central pith and medullary rays extending outward to the bark. All the trees of cold climates, and the principal part of those in hot, are exogenous, and are readily distinguished from those that are endogenous by the reticulated venation of their leaves, and by their seeds having two cotyledons (dicotyledonous). The parts of the flower are generally in fours or fives.

Ex'orcism, the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient church that certain persons, those particularly who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism.* There were even certain men who made this a regular profession, and were called *exorcists.* Exorcism still makes a part of the beliefs of some churches.

Expansion, in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid the less the expansion; thus water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F.; and has its maximum density at 39.2° F. Just before it reaches the freezing point (32°), it begins to expand again, and expands more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes, etc., when water is freezing in them.

Expectation, in the doctrine of chances, the value of any prospect of prize or property depending upon the happening of some uncertain

event. A sum of money in *expectation* upon a certain event has a determinate value before that event happens. If the chances of receiving or not receiving a hundred dollars, when an event arrives, are equal; then, before the arrival of the event the expectation is worth half the money. *Expectation of life,* the probable duration of the life of individuals of any given age. A rough estimate of any one's expectation of life is made by calculating two-thirds of the difference between his or her present age and eighty.

Exper'iments, an operation designed to discover some unknown truth, principle, or effect, or to establish it when discovered. It differs from observation in the fact that the phenomena observed are, to a greater or less extent, controlled by human agency. Experiment distinguishes the modern method of investigating nature, and to it we owe the rapid strides made in chemistry, physics, etc.

Exploits', River of, a river of Newfoundland. It is about 150 mi. long.

Explo'sion, a sudden bursting, generally due to the rapid production of gaseous matter from solids or liquids. Thus the explosion of gunpowder is due to the sudden formation and expansion of gases into which the powder is converted by chemical agency. Explosions are often caused by the elastic force of steam confined in boilers, etc.

Explo'sives are compounds practically available in war, in mining, and in general use for the sudden development of immense force. They comprise gunpowder, gun cotton, nitroglycerine with its compounds, dynamite, lithofracteur, etc.

Expo'nent, in algebra, the number or figure which, placed above a root at the right hand, denotes how often that root is repeated, or how many multiplications are necessary to produce the power. Thus a^2 denotes the second power of the root a, that is, a multiplied by a; a^4 denotes the fourth power. The figure is the *exponent* or index of the power. To express the roots of quantities fractional exponents are used: thus, $a^{\frac{1}{2}}$, $a^{\frac{1}{3}}$, $a^{\frac{1}{n}}$, denote the square root, the cubic root, and the n^{th} root of a.

Ex Post Facto, in law, by something done after and bearing upon something previously done; thus, a law is said to be *ex post facto,* or retrospective, when it is enacted to punish an offense committed before the passing of the law.

Extension, 1, In physics and metaphysics, that property of a body by which it occupies a portion of space. Extension is an essential as well as a general property of matter, for it is impossible to form a conception of matter, however minute may be the particle, without connecting with it the idea of its having a certain bulk and occupying a certain quantity of space. Every body, however small, must have length, breadth, and thickness; that is, it must possess the property of extension. Figure or form is the result of extension, for we cannot conceive that a body has length, breadth, and thickness, without its having some kind of figure, however irregular. 2,

In logic, *extension* is the extent of the application of a general term, that is, the objects collectively which are included under it; thus, the word figure is more extensive than triangle, circle, parallelogram, etc; European more extensive than French, Frenchman, German, etc. Matter and mind are the most extensive terms of which any definite conception can be formed. Extension is contrasted with *comprehension* or *intension*.

Ex′tract, a term to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, etc. In modern pharmacy the term is applied to two kinds of preparation from vegetables. One is got by digesting the plant in water or other solvent, and evaporating or distilling away the excess of solvent until the extracted matter is sufficiently inspissated. The other is got by bruising the plant in a mortar, separating the juice, warming it until the green coloring matter separates, and filtering it off. The juice is next heated until the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green coloring matter added and well mixed, and the evaporation is thereafter continued until the required concentration is attained. Extracts must be capable of being redissolved, so as to form a solution like that from which they were derived. Extracts are used in cookery, medicine, and the manufacture of perfumery. See *Beef, extract of; Vanilla; Lemon.*

Extravasa′tion, an escape of some fluid, as blood or urine, from the vessel containing it. *Blood extravasation,* in contusions and other accidents, is when blood-vessels are ruptured by the injury, and the blood finds its way into the neighboring tissues. In some accidents to the urethra and bladder extravasation of urine is a very serious occurrence.

Extremities, the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior.

Exu′ma, GREAT and LITTLE, two of the Bahama Islands. The former is 30 mi. long and 3 mi. wide, and has a good harbor. Pop. 2,300.

Eyck (īk), HUBERT (1366–1426) and JAN VAN (1390–1441), brothers, famous painters of the old Flemish school, b. at Maaseyck. They lived first at Bruges, whence the younger brother is called John of Bruges, and afterward at Ghent, to which they removed about 1420. Here they executed the celebrated *Adoration of the Lamb* for the cathedral of Ghent; a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It was in two horizontal divisions, comprising ten panels, of which only the two central ones remain at Ghent, the others being at Berlin. Jan finished the work in 1432, and returned to Bruges, where he remained till his death. His reputation became very great even during his lifetime, by his share in the introduction of oil painting; the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck also introduced improvements in linear and aerial perspective, and in painting upon glass.

Eye, the visual apparatus of animals, consisting in man of the globe of the eye, the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus. See *Anatomy.*

Eyre (ār), EDWARD JOHN (1815–), Australian explorer and colonial governor. He went to Australia in 1833. In 1839 he discovered Lake Torrens, and in 1840 explored its eastern shores and the adjacent Flinders Range. He then commenced his perilous journey along the shores of the Great Australian Bight, and reached King George's Sound, in Western Australia, a distance of 1,200 mi., with a single native boy, having left Adelaide more than a year before. In 1845 he published *Discoveries in Central Australia.*

Ezra, a celebrated Jewish scribe and priest. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I, about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging, and in some measure, it is believed, settling the canon of Scripture, are specially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he d. in Jerusalem; others assert that he returned to Babylon, and d. there at the age of 120 years.

F

F, the sixth letter of the English alphabet, is a labio-dental articulation, formed by the passage of breath between the lower lip and the upper front teeth. It is classed as a surd spirant, its corresponding sonant spirant being *v*, which is distinguished from *f* by being pronounced with voice instead of breath, as may be perceived by pronouncing *ef, ev.* (In *if, of,* however, *f* is=*v.*) The figure of the letter F is the same as that of the ancient Greek digamma, which it also closely resembles in power.

F, in music, is the fourth note of the diatonic scale.

Fa, the name given by Guido to the fourth note of the natural diatonic scale of C.

Fabii (fā′bi-ī), an ancient and renowned family of Rome, who, having undertaken the duty of defending Roman territory against the incursions of the Veientines, established themselves at a post on the river Cremera. Being drawn into an ambush they were killed to a man (B. C. 477). A boy, who happened to be left in Rome, became the second founder of the family. Among its celebrated members in aftertimes were Fabius Maximus, whose policy of defensive warfare was so successful against Hannibal in the second Punic War (B.C. 217); and Fabius Pictor, who lived about the same time and wrote a history of Rome, thus being the earliest Roman historian.

Fable, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, in which animals and sometimes inanimate things are feigned to act and speak with human interests and passions, for the purpose of inculcating a moral lesson in a pleasant and pointed manner. The fable consists properly of two parts—the symbolical representation, and the application, or instruction intended to be deduced from it, which latter is called the *moral* of the tale, and must be apparent in the fable itself. The oldest fables are supposed to be the Oriental; among these the Indian fables of Pilpay, or Bidpai, and the fables of the Arabian Lokman, are celebrated. Among the Greeks, Æsop is the master of a simple but very effective style of fable. The fables of Phædrus are a second-rate Latin version of those of Æsop. In modern times Gellert and Lessing among the Germans, Gay among the English, the Spanish Yriarte, and the Russian Ivan Kriloff, are celebrated. The first place, however, among modern fabulists belongs to the French writer La Fontaine.

Fabliaux (fab′li-ō), in French literature, the short metrical tales of the Trouvères, or early poets of the Langue d'Oil, composed for the most part in the twelfth and thirteenth centuries. These productions were intended merely for recitation, not for singing, and had as their principal subjects the current gossip and news of the day which were treated in a witty and sarcastic way. The fabliaux lashed not only the clergy and nobility in their degeneracy, but even mocked the religious chivalrous spirit, and the religious and knightly doctrines and ceremonies.

Fabricius, CAIUS (with the cognomen Luscinus), a pattern of ancient Roman virtue in his fearlessness, integrity, moderation, and contempt of riches. When consul in 279 B. C., Fabricius delivered up to Pyrrhus his treacherous physician, who had offered to poison his royal master for a sum of money. In gratitude for the service the king released the Roman prisoners without ransom. In 275 B. C. Fabricius was chosen censor. He died about 250 B. C.

Fabricius, JOHANN CHRISTIAN, German entomologist, born 1748. After studying at Copenhagen, Leyden, Edinburgh, and under Linnæus at Upsala, he obtained the post of professor of natural history in the University of Kiel. In 1775 appeared his *System of Entomology* which gave to this science an entirely new form. In 1778 he published his *Philosophia Entomologica,* written upon the plan of the well-known *Philosophia Botanica* of Linnæus. He died March 3, 1808.

Façade (fa-sād′ or fa-säd′), the face, front view, or principal elevation of a building. It usually contains the principal entrance.

Face, the front part of the head. The bony basis of the face, exclusive of the thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the *bones of the face.* The anterior part of the skull (*os frontis*) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the base of the skull. The other bones are firmly joined together and incapable of motion. In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. The face of birds comprehends the ophthalmic regions, cheeks, temples, forehead, and vertex; the face of insects includes all between the proboscis and the prothorax.

Faces, FALSE, are made as follows: The sculptor or modeler, with his moist modeling clay forms in high relief, half a face with conventional features. This is done in order that he may arrive at the proper proportions and distances; but as soon as the regular features are made he begins to distort them. A wad of clay is put on to the end of the nose, and a twist, punch, or pull transforms it into whatever shape he desires. The chin, mouth, cheeks, lips and forehead are changed to suit. The modeler is careful to form his model so that there will be no undercuts, for a hollow plaster of Paris cast is made of the model, and

this cast is the mold in which the pasteboard false face is made. If the model has undercuts, or surfaces which curve under, the pasteboard cannot be drawn from the mold. The mold or hollow cast is made by pouring plaster of Paris made thin with water over the face of the model. The workman who does this first dashes the thin plaster into the cracks and crevices of the face and then fills the mold up until it is one to two inches thick. When the plaster is set, it is taken from the clay model and is ready for the workmen who make the pasteboard faces. The pasteboard is soaked in water until it is soft and mushy. In this condition the plastic model will conform to every curve and mark in the plaster mold. The first layer is pressed into the mold with the fingers, great care being taken to completely cover every bit of the surface. When this stratum of pasteboard is pressed into shape, another layer is laid on and the face is built of successive layers until several thicknesses of the mask is reached. Flour paste is used to hold the paper together. After they are dried, they are daubed with paint. The hair, mustache, and whiskers are glued to the face after the masks are finished.

Facet or facette (fas'et or fa-set'), (literally, a little face), one of a series of small circumscribed plane surfaces, as one of the small plane surfaces of a crystal or a cut gem.

Facial Nerve, a nerve of the seventh pair of cranial nerves, a motor nerve which supplies the muscles of expression on either side of the face. Paralysis of this nerve produces *facial paralysis*, the result of which is that the affected side is smooth, unwrinkled, and motionless, the eyelids are wide open and cannot be closed, and the muscles of the sound side, having it all their own way, drag the mouth to that side.

Factor, in arithmetic, the multiplier and multiplicand, from the multiplication of which proceeds the product; thus 7 and 4 are the factors of 28. In algebra, any expression which is considered as part of a product, is considered a factor.

Factor, in commerce, an agent employed to do business for another in buying or selling, or in the charge of property. A factor seems to differ from a broker in holding a wider and more discretionary commission from his employer, in being able to buy and sell in his own name, and in having a lien on goods for his outlay; but the difference depends so much upon the usage of the particular trade, or upon the special instructions constituting the agency, that no exact line of demarkation can be drawn between them. The term factor has, in common usage, generally given place to the terms agent and broker, the former applied in the more general, the latter in the more restricted sense. It is still retained in some special cases, as in that of house factors and factors on landed property in Scotland, who have charge of the letting and general management of house property, farms, etc.; called in England estate agents.

Fac'tory (from *factor*), a name which appears originally to have been given to establishments of merchants and factors resident in foreign countries; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry, resulting from the free use of machinery and the consequent subdivision of labor. Among the advantages of the factory system are generally counted: 1, increased productiveness arising from the minute division of labor; 2, the mechanical accuracy and the cheapness of the product turned out by machinery; 3, the facilities for union and cooperation for common improvement afforded by bringing large masses of workmen together. But this last consideration is probably more than counter-balanced by the smaller amount of independent intelligence called forth in the individual worker, through the monotony of the minutely subdivided operations. Decided disadvantages of the factory system are the unhealthiness of the crowded rooms, where the air is full of deleterious elements; and the increasing demand on the labor of women and children, interfering as it does with the economy of domestic life.

Faculties, Court of, in English law, a jurisdiction or tribunal belonging to the archbishop. It does not hold pleas in any suits, but has power to grant licenses or dispensations, such as, to marry without bans, to remove bodies previously buried, etc.

Faculty, the members, taken collectively, of the medical or legal professions; thus we speak of the medical faculty, the faculty of advocates. The term is also used for the professors and teachers collectively of the several departments in a university; as, the faculty of arts, of theology, of medicine, or of law.

Faculty, in law, is a power to do something, the right to do which the law admits, or a special privilege granted by law to do something which would otherwise be forbidden.

Fahlerz (fäl'erts), or gray copper ore, is of a steel-gray or iron-black color. It occurs crystallized in the form of the tetrahedron, also massive and disseminated. Specific gravity 4.5. It consists of from 30 to 40 per cent. of copper with iron and sulphur; but it also contains in very variable proportions zinc, lead, antimony, and silver.

Fahrenheit (fä'rĕn-hīt), Gabriel Daniel (1686–1736), German physicist, known for his arrangement of the thermometer, was b. at Dantzic in 1686. Abandoning the commercial profession for which he had been designed, he settled in Holland to study natural philosophy. In 1720 he effected a great improvement by the use of quicksilver instead of spirits of wine in thermometers. He invented the Fahrenheit scale (see *Thermometer*), and made several valuable discoveries in physics.

Faience (fā-yens'), imitation porcelain, a kind of fine pottery, superior to the common pottery in its glazing, beauty of form, and richness of painting, and of which several kinds are distinguished by critics. It derived its name

from the town of Faenza, in Italy, where a fine sort of pottery called *majolica* was manufactured as early as the fourteenth century. The majolica reached its greatest perfection between 1530 and 1560. Rich collections of it are found in the Louvre, at Berlin, and at Dresden. The modern faience appears to have been invented about the middle of the sixteenth century, at Faenza, as an imitation of majolica, and obtained its name in France, where a man from Faenza, having discovered a similar kind of clay at Nevers, had introduced the manufacture of it. True faience is made of a yellowish or ruddy earth, covered with an enamel which is usually white, but may be colored.

Fainéants (fā-nā-än) (Fr. "do-nothings"), a sarcastic epithet applied to the later Merovingian kings of France, who were puppets in the hands of the mayors of the palace. Louis V, the last of the Carlovingian dynasty, received the same designation.

Fainting (or Syncope), a sudden suspension of the heart's action, of sensation, and the power of motion. It may be produced by loss of blood, pain, emotional disturbance, or by organic or other diseases of the heart. It is to be treated by placing the patient on his back in a recumbent position or even with head slightly depressed, sprinkling cold water on his face, applying stimulant scents to the nostrils, bringing back the blood to the brain.

Fairbairn, Sir William (1789–1874), British civil engineer, b. at Kelso, Roxburghshire. He was apprenticed as an engine wright at a colliery in North Shields, and commenced business on his own account in Manchester with a Mr. Lillie in 1817, where he made many improvements in machinery, such as the use of iron instead of wood in the shafting of cotton mills. About 1831, his attention having been attracted to the use of iron as a material for shipbuilding, he built the first iron ship. His firm became extensively employed in iron shipbuilding at Manchester and at Millwall, London, and had a great share in the development of the trade. He shares with Mr. Stephenson the merit of constructing the great tubular bridge across the Menai Strait.

Sir William wrote many valuable professional books and papers, among which we may mention: *On Canal Steam Navigation* (1831); *Iron—its History, Properties, and Manufacture* (1841); *Application of Iron to Building Purposes* (1854); *Iron Shipbuilding* (1865).

Fairchild, James H., b. in Mass. in 1817. He graduated at Oberlin College in 1838 and became professor of languages in 1842. He later turned his attention to mathematics, moral philosophy, and theology. He became president of that college in 1866. Among his works are *Moral Philosophy*, *Systematic Theology*, and *Memoirs of Chas. G. Finney*.

Fairfax, Thomas, Lord (1611–1671), a distinguished commander and leading character in the civil wars which distracted England in the seventeenth century. He was b. at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648.

Fairies.—The small folk familiarly spoken of everywhere, though known among different peoples by various names, are usually of a kindly disposition, and typical of airy grace and beauty. The Persian Peri is, perhaps, the most perfect ideal of the fairy type, and the Irish fairy the most degenerate. For every nation has a fairy race of its own, and there are many grades between the beautiful Peri, who lives upon perfumes, and seeks by loving deeds to win the joys of Paradise, and the mischievous elves that substitute decrepit old horses for good milch cows in the fields of the Irish peasantry. In Russia the tiny creature must, of course, be clad in fur to be in harmony with the climate of the steppes, but is endowed with marvelous facility of changing form, and may be a bird or a horse, a frog or a beautiful woman at will. To the Chinese a fairy without a queue would be quite unimaginable. And the Hindu fairy is as wise as the ideal of the Brahmin, while the Swedish tomte, little old men in pointed caps and fur-trimmed coats, inhabit the barns and guard the precious stores of grain in the cold northern peninsula. In England the fairies are only thought of in connection with the flowery dells of summer time, and one especial night, the eve of midsummer, is set apart for them, as is Hallowe'en for the witches and hobgoblins.

Among nearly all peoples there is a distinction of good and evil fairies, the good spirits being denizens of the air, and the dark ones dwelling underground, a belief which seems to clearly indicate a personification of light and darkness. In the north of Europe, the system of fairy mythology is very logically defined. There are three races of supernatural beings; the Gods, who are supreme: the Alfs, inhabitants of Alfheim, who are spirits of light, and have power over all nature that is dependent upon light and air; while the Dwarfs, or Trolls, are subterraneous spirits, and have the treasures of the earth for their kingdom. The Dwarfs have the power of invisibility, can foresee the future, may confer prosperity and bodily strength at pleasure. They are very musical, and often can be heard singing underground, but they object to noise, and may be driven away by clanging church bells. They are very rich, for all the hidden wealth of the earth is theirs. They are subject to death, but only after a long period of existence. They are very fond of dancing by moonlight on the grass.

The various Teutonic nations have their distinct fairy legends with slightly differing nomenclature. There is, however, yet another class of spirits not included in this classification but known among many people, the nixies or merfolk—merman and mermaid—water spirits, and are probably distinct enough to warrant another classification and the assignment by the supreme powers of another race of victims to the realm of water.

Shakespeare has put into permanent form the household tales of England concerning the fayes and elves that were believed to inhabit

every English hillside. The fairies were known to be in danger of being subjected to the will of man by means of certain spells, and they were most obedient servants when once secured, for their superhuman faculties were then at the service of their human master. Moonlight is supposed to be the especial atmosphere adapted to fairy occupations, and secluded mossy dells their favorite haunts.

The probable origin of all these interesting creatures of imagination is much a matter of individual theory. That they are the outgrowth of mythology and folklore, seems very probable. The mythology of any race had its undoubted rise in the beginnings of language. When the primitive people were called upon to express themselves concerning any phase of nature in their surroundings, they, necessarily ignorant of the abstract idea or symbol, gave it a concrete and familiar name. The storm, strange and mysterious to those to whom meteorology was, of course, unknown, appeared as some dark and powerful being on rushing wing, and in the glowing sun and its motion across the sky, it was easy to see a glistening chariot guided by a steady hand. In time there came to be certain definite attributes of the invisible recognized in often recurring effects. The more powerful natural forces gave rise to mythology as the poetic explanation of their wonders, and the daintier phases to a fairy lore of increasing charm and beauty, according to the culture of the people. Thus the Greeks, besides their elaborate system of mythology, had also a most exquisite fairy lore. The wood nymphs and the water nymphs made the sunny land of Greece, to the imaginative and romantic Greeks, a very bower of fanciful beauty and have enriched the poet lore of after ages. The throbbing life of nature, which they felt about them, the bubbling ecstasy of the brooks, the nodding grace of the flowers and the stately companionship of the trees must be explained by something with human attributes, it must be small and delicate for it was not discerned by human eyes, and it must be beautiful to be a part of beautiful nature. Dwarfs and giants, hobgoblins and dragons, are probably all distorted images of the same imaginative impulse. In many localities the giants and the fairies were supposed to be at enmity, and contests took place. In the Orient the giants were a peculiar race, capable of almost infinite expansion and contraction; one might be confined in a small phial, but upon release, would assume terrible proportions. Side by side with the symbolism of nature forces, there must also have sprung up a legendary account of human prowess. The deeds which excited the admiration of a primitive community must need be told and retold, and, of course, garnished by the imagination of succeeding narrators, they grew and waxed strong in wonder and great achievement. Thus, the folk lore of any nation developed with its mythology, and in time each borrowed from the other and each became more imaginative and more highly idealized, until the early

heroes became gods and the divinities had their birth among that particular people. The war between Jotünheim and Asgard was as real to the people of the North as any tale of war with kindred tribes, for their struggle of existence meant the disarming of the conquering power of the frost giants, which, allowed to rule, would make silent and helpless all forms of life, but kept in abeyance by the sturdy energy of the Northern heroes, typified in Thor and Baldur as they wield the weapons of fertility and gather the ammunition of the harvests, brought up a strong and vigorous nation. As the veneration of the dead continued from generation to generation, and the individual ghosts became more numerous and more removed from living associations, they may have transmigrated into fairies, for in some localities ghost and fairy seem to be almost synonymous terms. In many places the fairy haunts are in cemeteries and on deserted graves, which points strongly to a connection between the practise of ancestor worship and fairy lore. Whatever the theories of fairy origin, however, the romance of the ages is bound up in the fairy tales of the nation, and they are a fruitful study.

Fair Oaks, Battle of, fought at Fair Oaks in Virginia, 7 mi. e. of Richmond, between the Confederates under General Johnston and the Union troops under General Mc Clellan, May 31, 1862. The loss on each side was nearly 6,000 men; the result was indecisive.

Fairs, periodical meetings of persons having goods or wares for sale in an open market held at a particular place, and generally for the transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. In Europe the numerous festivals of the church afforded the most favorable opportunity for the establishment of these markets.

In the Middle Ages fairs were of great importance, and were specially privileged and chartered by princes and magistrates, public proclamation being made of their commencement and duration. But modern facilities of communication have much diminished the necessity for periodical markets, and it is now chiefly among agriculturists that they are of much importance. Fairs in the sense of markets are unknown in the U. S., but the term is usually given to ladies' fancy bazaars, collections of fine art or the higher industries for public exhibition, etc.

In Europe the most important fairs of the present day are those at Leipsic and Frankfort-on-the-Main in Germany, at Lyons in France, and at Nijni-Novgorod in Russia. The latter is, indeed, the largest fair in the world. Among the fairs which were once celebrated saturnalia, may be mentioned Donnybrook Fair in the county of Dublin; Bartholomew and Greenwich Fairs, London; and Glasgow Fair.

Fairweather, Mount, on the w. coast of North America, in Alaska. It rises to the height of 14,900 ft. and is covered with perpetual snow.

Fakirs (fȧ-kērz′) (lit. "poor men"), a kind of fanatics met with chiefly in India and the neighboring countries, who retire from the world and give themselves up to contemplation. They are properly of the Mohammedan religion, but the term is often used for a mendicant of any faith. They are found both living in communities and solitary. The wandering fakirs gain the veneration of the lower classes by absurd penances and self-mutilations.

Falcon (fą′kn), a name of various birds of prey, members of the family Falconidæ. The falcons proper (genus *Falco*), for strength, symmetry, and powers of flight are the most perfectly developed of the feathered race. They are distinguished by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares, and water fowl. It is found over a wide range of northern territory. The peregrine falcon is not so large as the jerfalcon, but more elegant in shape. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, etc. Its flight is exceedingly swift, said to be as much as 150 mi. an hour. The peregrine falcon was one of those most frequently used in falconry.

Greenland Falcon.

Falconer (fą̈k′-nėr), Hugh, Scottish naturalist (1808–1865). After studying arts at Aberdeen and medicine at Edinburgh he went to India as a surgeon in 1830. Here he made valuable geological researches, and turned his attention to the introduction of tea cultivation. He visited England in 1843 and published an illustrated descriptive work entitled *Fauna Antiqua Sivalensis* (*Ancient Fauna of the Siválik Hills*).

Hooded Peregrine on the Block.

One end of the leash is attached to the jesses, the other to a ring driven into the side or top of the block; and thus the hawk is prevented from escaping.

Falcon′idæ, a family of birds of prey, in which the destructive powers are most perfectly developed. The family includes the different species of eagles as well as the hawks and falcons properly so called.

Falconry (fą′kn-ri), the pursuit of game by means of trained falcons or hawks; also called *Hawking*. Falconry is a very old amusement in Europe and Asia. In the Middle Ages it was the favorite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent. In Germany Henry the Fowler and the Emperor Frederick the Second were much addicted to this sport, the latter having written a work on falconry. In France it reached its height under Francis I, whose grand falconer had under him an establishment of fifteen nobles and fifty falconers, costing annually about 40,000 livres. In Britain it was practised among the Anglo-Saxons, but grew still more in favor after the Norman Conquest.

Head and Foot of Brazilian Eagle.

Faler′nian Wine, an ancient wine of great repute among the Romans. It was made from the grapes grown on Mount Falernus in Campania. It was strong and generous, probably much resembling modern sherry.

Fal′kirk, a parliamentary burg of Scotland in Sterlingshire, 21½ mi. w. by n. of Edinburgh. In the town or its vicinity are the Carron iron works, the Falkirk foundry, and other works, collieries, chemical works, distilleries, etc. Falkirk is connected with the port of Grangemouth by a railway 3 mi. long. The Trysts of Falkirk, held on Stenhousemuir, 3 mi. to the n.n.w., are the largest cattle fairs in Scotland. Falkirk is of great antiquity, and is associated with many remarkable historical events. In the neighborhood was fought the battle of Falkirk in 1297, between Sir William Wallace and Edward I, the Scots, who were much inferior in number, being defeated. Pop. 16,615.

Falkland Islands, an island group belonging to Great Britain, in the South Atlantic Ocean, about 300 mi. e. of the Straits of Magellan. They consist of two larger islands, East Falkland and West Falkland, containing respectively about 3,000 and 2,300 sq. mi., with a great number of smaller ones surrounding

them; total area 6,500 sq. mi. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for the sheep and cattle, the rearing of which is the principal industry. Fish and sea fowl abound. Wool, frozen meat, hides, and tallow are the chief exports; total value in 1891, $653,760. The climate is equable and very healthy. The Falkland Islands were discovered by Davis Aug. 14, 1592. Settlements were afterward formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them. The colony has a governor and other officers appointed by the crown. Port Stanley, in East Falkland, is a thriving settlement. Pop. of the group, 1,800.

Fal′lacy, in logic, occurs when an argument is used as decisive of a particular issue, which in reality it does not decide. Properly, a fallacy is a fault in the form of reasoning, but the term is applied also to faults in the substance of the argument, viz, proving one proposition by assuming another which is identical with it; mistaking the point at issue; arguing as if sequence were the same thing as cause and effect.

Fall of Bodies.—All bodies on the earth, by virtue of the attraction of gravitation, tend to the center of the earth. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. In the air bodies fall with unequal velocities, a piece of paper, for instance, more slowly than a ball of lead; and it was formerly thought that the velocity of the fall of bodies was in proportion to their weight. This error was attacked by Galileo, who, experimenting with balls of different substances which he dropped from the tower of Pisa, was led to the conclusion that the resistance of the air acting on different extents of surface was the cause of the unequal velocities, and that in a vacuum all bodies would fall with the same velocity. The truth of this last proposition was first demonstrated by Newton in his celebrated "guinea-and-feather" experiment, where a guinea and feather are shown to fall side by side in the vacuum of the air pump. This experiment proves that the force of gravitation in bodies is proportional to their inertia, that is, to their mass. The laws of falling bodies, that is, of bodies falling freely in a straight line and through a distance short in comparison with the earth's center, are the following:—

1. When a body falls from rest it acquires velocity at the rate of about 32.2 ft. per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the center of the earth. See *Gravity, Force of.* At the end of five seconds, therefore, the body would be found to be moving at the rate of 5 x 32.2, that is, 161 ft. per second.

2. The space fallen through in the first second is half of 32.2, that is, 16.1 ft.; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16.1. Thus, in three seconds a body falls 9 x 16.1 ft., or 144.9 ft.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32.2. Thus if a body falls 9 ft., the square of the velocity acquired is 2 x 32 x 9, or 576 ft. per second, 32 being used instead of 32.2; and taking the square root of 576, we find that a velocity of 24 ft. is acquired in a fall of 9 ft.

4. When a body is projected vertically upward wth a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32.2; and it rises to a height found by dividing the square of that number by 2 x 32.2, or 64.4. For a machine used in verifying the laws of falling bodies see *Attwood.*

Fallow Deer, a European and Western Asiatic deer, the *Cervus dama.* It is smaller than the stag, of a brownish bay color, whitish beneath, on the insides of the limbs, and beneath the tail. The horns, which are peculiar

Fallow Deer.

to the male, are very different from those of the stag; they are not properly branched, but are broader toward the upper part, and divided into processes down the outside. A simple snag rises from the base of each, and a similar one at some distance from the first. It was introduced at an early period into Britain, and is kept in many English parks.

Fallow Land is ground that has been left uncultivated for a time, in order that it may recover itself from an exhausted state. Strictly speaking, fallow ground is left altogether without crops; but in agricultural usage strict fallow is not always adopted, and the term fallow is applied to various modes of treatment, of which at least three distinct varieties are recognized: *bare fallow, bastard fallow,* and *green-crop fallow.* Bare fallow is that in which the land remains completely bare for a whole year; in bastard fallow it is plowed up and worked after the removal of a spring or summer crop, preparatory to the sowing of a root or forage crop, to occupy the ground during autumn or winter; in green-crop fallow the

land is sown with a root crop, such as turnips or potatoes, placed in rows far enough apart to admit of the intermediate spaces being stirred, pulverized, and cleaned, during its growth, by horse or hand implements.

Fall River, Bristol co., Mass., on an arm of Narragansett Bay and Taunton River, 53 mi. s.s.w. of Boston. It is at the head of deep-water navigation, and the terminus of a line of steamers from New York. It has extensive cotton, woolen, and calico-printing factories, iron works, etc. Pop. 1900, 104,863.

False Imprisonment, the unlawful imprisonment or detention of any person. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

False Personation (Law).—All forms of false personation, for the purpose of obtaining the property of others, are punishable by the criminal law; as instances, the personation of the owner of any share, stock, or annuity, etc. The false personation of voters at an election is a misdemeanor, the punishment of which is determined by state statute, involving fine, imprisonment, and deprivation of the rights of citizenship for a certain period.

False Pretences (Law).—False representations and statements made with a fraudulent design to obtain "money, goods, wares, and merchandise," with intent to cheat. At common law a misdemeanor, punishable by statute.

Falset'to (Ital.) applies, in singing, to the notes above the natural compass of the voice. It is also called the *head* or *throat* voice, in contradistinction to the *chest* voice, which is the natural one.

Fal'ster, an island belonging to Denmark, situated at the entrance of the Baltic, e. of Laaland, from which it is separated only by a narrow strait; flat, well watered and wooded; productive in grain, pulse, potatoes, and, above all, fruit; area 183 sq. mi. The principal town is Nykjöbing. Pop. 30,212.

Familiar Spirits, demons or evil spirits supposed to be continually within call and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring or the like, sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in all ages and countries, under various forms.

Family, in zoological classifications, a group of individuals more comprehensive than a genus and less so than an order, a family usually containing a number of genera, while an order contains so many families.

Famine, a dire want of food affecting considerable numbers of people at the same time. Irregular rainfalls in tropical climates, imperfect methods of irrigation, or the too exclusive dependence of the mass of the people on a single article of food which happens to fail, are among the commonest causes of famines. In the early and mediæval ages they were frequent; but the rapidity of modern communication and transport has made the rigor of famine almost impossible in Europe. India has long been the seat of terrific famines; but of late the British officials have been very successful in organizing relief measures. Among the more recent are that in Northwest India (1837–38), in which above 800,000 perished; that in Bengal and Orissa (1865–66), when about a million perished; that in Bengal (1847), which was very successfully treated; that in Bombay, Madras, Mysore (1877), in which about half a million died. In China a great famine took place in 1877–78, in which over nine millions are said to have perished; another took place in 1888–89 owing to the overflow of the Yellow River. A destructive famine visited India in 1897.

Fan, the name of various instruments for exciting a current of air by the agitation of a broad surface. 1, An instrument made of wood or ivory, feathers, thin skin, paper, variously constructed and mounted, and used by ladies to agitate the air and cool the face. As an article of luxury the fan was well known to the Greeks and Romans. They are said to have been introduced into England from Italy in the reign of Henry VIII. 2, Any contrivance of vanes or flat discs revolving by the aid of machinery, as for winnowing grain, for cooling fluids, urging combustion, assisting ventilation, etc., is also so called.

Fanat'icism, is the term applied more particularly to the extravagance manifested in religious matters by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiastic views, but also of inordinate and not unfrequently persecuting measures. By an extension of the term it is also sometimes applied to other forms of extravagance.

Fancy, a term approaching imagination in meaning. In its general acceptation it refers both to the forms of the imagination and to the mental faculty which produces them; but it is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them.

Fandan'go, an old Spanish dance, which originated most probably with the Moors in Andalusia. It is seldom danced but at the theater, and in the parties of the lower classes. It is danced by two persons only, who never touch so much as each other's hands; their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

Faneuil Hall (fan'ū-il), a public building in Boston; built by Peter Faneuil, as a gift to the town, and comprised, originally, a market house and a townhall, with other rooms. It was burned in 1761 and rebuilt in 1763. The hall is famous as the place where stirring speeches were made at the outbreak of the war for American independence. It was here that, in 1773, an immense public meeting was

held, at which the "Boston Tea Party" was organized. From the fact that it was the meeting place of so many revolutionary parties it obtained the name, "Cradle of Liberty."

Fan-palm, a name sometimes given to the taliput palm, a native of Ceylon and Malabar. It is also applied to the Mauritia palm, a tree, which grows in great abundance on the banks of the Orinoco River in South America, and which yields the natives of these regions food, wine (made from its sap), and cordage, besides serving them for housing during the inundations to which the country is subject.

Fans, an African race of people inhabiting the region of the west coast about the Gaboon River and the Ogoway. They are an energetic race, skilled in various arts, and are rapidly increasing in numbers. They are cannibals, but contact with Europeans is leading them to give up the practise.

Fan-tail, a variety of the domestic pigeon, so called from the fan-like shape of their tails. Also a name applied to certain Australian birds of the fly-catcher family.

Fan-tracery, in architecture, elaborate geometrical carved work, which spreads over the surface of a vaulting, rising from a corbel and diverging like the folds of a fan. Fan-tracery vaulting is much used in the perpendicular style, in which the vault is covered by ribs and veins of tracery, of which all the principal lines diverge from a point, as in Henry VII's chapel, Westminster.

Far'aday, Michael (1791–1867), one of the greatest of English chemists and physicists, was b. in humble circumstances at Newington Butts, near London. Sir Humphry Davy appointed him his assistant at the Royal Institution. In 1829 he became lecturer at the Royal Military Academy at Woolwich, and in 1833 he was appointed to the newly established chair of chemistry at the Royal Institution. It was while in this office that he made most of his great electrical discoveries. His communications to the Philosophical Transactions have been published. In 1832 he received the honorary degree of D. C. L. from Oxford, and was made an honorary member of the Academy at Berlin. In 1835 he received a pension of $1,500 a year from Lord Melbourne. Among his published works we may mention the following: *Researches in Electricity; Lectures on Non-metallic Elements; Lectures on the Forces of Matter, Lectures on the Chemical History of a Candle.*

Farallo'nes, a group of small islands in the Pacific, about 30 mi. from the entrance to the Bay of San Francisco.

Farewell, Cape, a cape at the southern extremity of Greenland.

Fargo, Cass co., N. D., on Red River of the North, 240 mi. n.w. of Minneapolis. Railroads: Northern Pacific, Great Northern, and C. M. & St. P. Industries: three flouring mills, and several small factories. Surrounding country agricultural. The town was first settled in 1871 and became a city in 1876. Pop. 1900, 9,589.

Faribault, Rice co., Minn. 53 mi. s. of St. Paul. Here are the state asylum for the deaf, dumb, and blind, and an Episcopal college. Pop. 1900, 7,868.

Fari'na, a term given to a soft, tasteless, and commonly white powder, obtained by trituration of the seeds of cereal and leguminous plants, and of some roots, as the potato. It consists of gluten, starch, and mucilage.

Fari'ni, Luigi Carlo (1812–1866), an Italian statesman and author. He studied medicine at Bologna, and practised as a physician. His *History of the Papal States* from 1814 to 1850 is well known. In 1862 he became president of the ministry; lost his reason in 1863.

Farming. See *Agriculture.*

Farne (or Ferne) **Islands,** a group of islets, England, in the German Ocean, off the north coast of Northumberland, 2 mi. e. by s. of Bamborough Castle, and separated from the mainland by a channel of about 1¾ mi. They have been the scene of several disastrous shipwrecks.

Farnese (fär-nā'ze), an illustrious family of Italy, whose descent may be traced from about the middle of the thirteenth century, and which gave to the church and the Republic of Florence many eminent names. The name of the Farnese is associated with several famous works of art found at Naples. Among the most noted are: *The Farnese Bull; Farnese Hercules; and Farnese Flora.*

Faroe Islands (fā'rō) (Sheep Islands), a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark, and are twenty-five in number, of which seventeen are inhabited. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn in Strömö, the largest island, is the seat of government. Pop. 11,221.

Far'ragut, David Glasgow (1801–1870), admiral of the U. S., entered the navy as midshipman at the age of 9. In 1821 he was promoted to a lieutenancy, and was actively engaged in his profession up till 1851, when he was appointed assistant inspector of ordnance. In 1855 he received a commission as captain. In 1861 he was assigned to go with the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in February of the following year. New Orleans surrendered to the combined attack of the land and naval forces on April 25, and Farragut after taking possession of Baton Rouge and Natchez, and running the batteries at Vicksburg, joined the Union fleet above. In consequence of his success at New Orleans he was promoted to the rank of rear admiral. In 1863 Farragut attempted to pass the batteries at Port Hudson, but was unsuccessful. In August, 1864, he attacked the Confederate fleet in the bay of Mobile, and forced it to surrender, thus making the fall of Mobile merely a question of time. July 25, 1866, he was made admiral, a grade which had not hitherto existed in the U. S. navy.

Farrar, Frederic William, The Ven., D. D., F. R. S., son of a clergyman, b. in Bombay, 1831; graduated at Cambridge, 1854; as

sistant master at Harrow in 1855; master of Marlborough College in 1871; archdeacon of Westminster 1883. Among his principal works are: *The Life of Christ* (1874), *Life of St. Paul* (1879), *The Early Days of Christianity* (1882), *Lives of the Fathers* (1889).

Fars (or Farsistan), a maritime province in the southwest of Persia, abutting on the Persian Gulf. It is mountainous, but has many rich and well-cultivated districts. The most important products are grain, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woolen, silk, and cotton goods; and in these and other articles an active trade is carried on, chiefly with Hindustan. Pop. est. 1,700,000.

Farthing, the fourth part of a penny; the modern form of the Anglo-Saxon *feorthung*, the fourth part of anything.

Farukhabad (or Farrakhabad) (*far-a*k-ä-bäd′), a city in the Northwest Provinces of British India, 2 or 3 mi. from the Ganges, a handsome well-built town, with avenues of trees in many of its streets. Pop. 62,437.

Farwell, Charles B., statesman and merchant, b. in New York state in 1823. He removed to Illinois and became county clerk of Cook co., 1853–61. He engaged in the wholesale dry goods business until 1870, when he was elected to Congress. He was re-elected in 1872–74, and was again elected in 1880. He was elected in 1887 to the U. S. Senate to fill the unexpired term of John A. Logan.

Fasces (fas′sēz), among the ancient Romans, a bundle of polished rods, in the middle of which was an ax, carried by lictors before the superior magistrates. The number of fasces and lictors varied with the dignity of the magistrate. In the city the ax was laid aside.

Fascination, the exercise of an overpowering and paralyzing influence upon some animals attributed to certain snakes, corresponding somewhat to the so-called evil eye among human beings. Squirrels, mice, and the smaller birds are said to be the most subject to this power; but the fact is far from clearly explained, and is not perhaps even sufficiently demonstrated. Most of the accounts agree in describing the animal fascinated as having a painful consciousness of its danger, and the power exercised over it, but to be unable to resist the desire to approach the fascinator. Some have endeavored to explain this power as the effect of narcotic emanations from the serpent which stupefy the weaker animal. Others regard it as bearing a striking analogy to the mesmeric influence which one human being sometimes has over another.

Fascines (fa-sēnz′), in the military art, bundles of boughs or rods from 6 to 18 ft. in length and usually 1 ft. in diameter, used in raising batteries, strengthening parapets, revetting slopes, etc. The twigs are drawn tightly together by a cord, and bands are passed round them at the distance of 2 ft. from each other. Very long thin ones are called *Saucissons or battery-sausages.*

1 2 3 4 5 6 7

1, Flemish (1341); 2, French (1410); 3, German (1530); 4, Spanish (1580); 5, French (1590); 6, 7, Beginning of seventeenth century.

Fashion, the prevalent style in dress and usages which society from time to time adopts and imposes by a sort of arbitrary law upon its members. In its less important details the law of fashion varies considerably, and is often little more than a play of caprice. On its better side it is an endeavor to embody in general and recognized forms the best judgment as to what is decorous and of good taste and feeling in the varying and often delicate situations which occur, where large and mixed companies are in the habit of meeting together.

Fasting, the partial or total abstinence of mankind and animals from the ordinary requisite supply of aliment, by which it is to be understood that quantity which is adapted to preserve them in a healthy and vigorous condition. It would appear that various warm-blooded animals are capable of sustaining total abstinence much longer than human beings. Cats and dogs have survived for several weeks without nourishment of any kind, but it is probable that few human beings could survive such deprivation for more than a week. The use of water without solid food

enables life to be sustained much longer than it could otherwise be.

Fasts, temporary abstentions from food, especially on religious grounds. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions and is the custom still preserved to some extent.

Fat, an oily concrete substance, a compound of carbon, hydrogen, and oxygen, deposited in the cells of the adipose or cellular membrane of animal bodies. In most parts of the body the fat lies immediately under the skin. Fat is of various degrees of consistence, as in tallow, lard, and oil. It is generally white or yellowish, with little smell or taste. It consists of two substances, stearin and elain or olein, the former of which is solid, the latter liquid. These elements are separated by pressing the fat between folds of bibulous paper, which absorbs the liquid or oil. By after-treatment with water the oil is separated from the paper. Fats are insoluble in water. When boiled with caustic alkalies they are decomposed yielding an alkaline salt of the fatty acid (soap) and glycerine. Human fat appears to contain no stearin, but margarin and olein. It is an excellent packing material in the body and gives the human frame its smooth, rounded contour. Being a bad conductor of heat, it is useful in retaining warmth, but its chief function is that of nutrition.

Fa'talism, the belief in fate, or an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or the Creator. Among notable historical examples of the belief in fate may be mentioned the old Greek conception of a fate which stood behind the gods themselves as a controlling power; the Mohammedan fatalism, which regards all things great and small as inexorably predetermined, so that no accident is possible.

Fata Morga'na, a name given to a very striking optical illusion which has been principally remarked in the Strait of Messina, between the coasts of Sicily and Calabria—a variety of mirage (which see). The images of men, houses, towers, palaces, columns, trees, etc., are occasionally seen from the coast, sometimes in the water, and sometimes in the air, or at the surface of the water. The same object has frequently two images, one in the natural and the other in an inverted position. The images of a single object are said to be sometimes considerably multiplied.

Fatehpur (*fa*t-e-pör'), Indian town in district of the same name, Allahabad division, Northwest Provinces, 50 mi. s.e. of Cawnpore. Pop. 21,328. The district has an area of 1,639 sq. mi., and a pop. of 683,745.

Fates (in Latin, *Parcæ*, in Greek, *Moirai*), in Greek and Latin mythology, the inexorable sisters who spin the thread of human life. The appellation *Clotho* (the spinner) was probably at first common to them all among the Greeks. As they were three in number, and poetry endeavored to designate them more precisely, *Clotho* became a proper name, as did

also *Atrŏpos* and *Lachĕsis*. Clotho means she who spins (the thread of life), Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find also in the northern mythology three beautiful virgins, the *Nornen*, who determine the fate of men. Their names are *Urd* (the past), *Varande* (the present), and *Skuld* (the future).

Fatherlasher, a fish of the genus *Cottus* or bull-head, from 8 to 10 in. in length. The head is large, and is furnished with several

Fatherlasher.

formidable spines. The fish is found on the rocky coasts of Britain, and near Newfoundland and Greenland. In the latter regions it attains a much larger size, and is a considerable article of food.

Fathom, a unit of length equal to 6 ft. It is chiefly used by sailors, who measure soundings, etc., in fathoms.

Fat'imite Dynasty, a line of caliphs claiming descent from Fatima, the favorite daughter of Mohammed, and of Ali, her cousin, to whom she was married. In the year 909 Abu-Mohammed Obeidalla, giving himself out as the grandson of Fatima, endeavored to pass himself off as the Mahdi or Messiah predicted by the Koran. Denounced as an impostor by the reigning caliph of Bagdad, he fled into Egypt, became caliph of Tunis, and soon conquered all Northern Africa from the Straits of Gibraltar to the borders of Egypt. His son wrested Egypt from the Abbasides in 970 and founded Cairo. The Fatimite dynasty was extinguished on the death of Adhed, the fourteenth caliph, and a new line began with Saladin.

Fatty Acids, a name given to such acids as have been separated from fats. Fats and fixed oils are composed of one or more acids combined with the radical glycyl. By boiling with potash or soda the fat is decomposed, glycerine and a soap being the products. By treating this soap with hydrochloric or sulphuric acid the base is removed and the fatty acid obtained free.

Fatty Degeneration, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by

fatty granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles, the heart, arteries, kidneys, etc. It is accompanied by great muscular flabbiness and want of energy, the sufferer looking at the same time fat and comparatively well.

Fatty Tissue, in anatomy, the adipose tissue, a tissue composed of minute cells or vesicles, having no communication with each other, but lying side by side in the meshes of the cellular tissue, which serves to hold them together, and through which also the blood-vessels find their way to them. In the cells of this tissue the animal matter called fat is deposited.

Faubourg (fō-bör), a suburb of French cities; the name is also given to districts now within the city, but which were formerly suburbs without it. Thus the *Faubourg St. Germain* is a fashionable quarter of Paris in which the ancient nobility resided.

Fault, in geology, a fracture of strata, accompanied by a sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently met with in coal beds, the miner coming unexpectedly upon an abrupt wall of other strata. The angle this makes with the plane of the bed he is working indicates whether he must look up or down for its continuation on the other side of the fracture. In mines these faults often serve for natural drains.

Faun, one of a kind of rural deities or demi-gods believed in among the Romans, inhabiting the forests and groves, and differing little from satyrs. Their form was principally human, but with a short goat's tail, pointed ears, and projecting horns; sometimes also with cloven feet. There are some famous antique statues of fauns, the *Dancing Faun* at the Uffizi in Florence (restored by Michael Angelo), the *Dancing Faun* at Naples, the *Faun* (of Praxiteles?) at the Capitoline Museum, Rome, the *Sleeping Faun*, etc.

Faure, François Felix, president of France, b. in Paris in 1841. He took an active part in the Franco-Prussian War and for his gallant services was decorated with the ribbon of the Legion of Honor in 1871. He became a member of the Chamber of Deputies in 1881, and later became under-secretary of state, which position he held until 1882. He was elected president in 1895 on the resignation of Casimer-Perier. d. Feb. 16, 1899.

Faust, Doctor John, a celebrated dealer in the black art, who lived in Germany, early in the sixteenth century. According to some accounts he was born in Suabia, others make him a native of Anhalt, others of Brandenburg. In his sixteenth year he went to Ingoistadt and studied theology, became in three years a *magister*, but abandoned theology, and began the study of medicine, astrology, and magic, in which he likewise instructed his familiar Johann Wagner, the son of a clergyman at Wasserburg. After Dr. Faust had spent a rich inheritance, he, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he traveled about, enjoying life in all its forms, but the evil spirit finally carried him off. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet shows of Germany, and the legend forms the subject of Goethe's great drama *Faust*, and furnishes the libretto for Gounod's famous opera of the same name. As early as 1590 the legend was dramatically treated in England by Christopher Marlowe.

Favre (fävr), Jules (1809–1880), a French politician; b. March 21, 1809, at Lyons. He studied law, and after distinguishing himself at the Lyons bar came to Paris in 1835, where he became famous as a defender of political prisoners. He was a leader of the party of opposition to the President Louis Napoleon. On the fall of the empire he became vice-president of the Government of National Defense and minister of foreign affairs.

Faw'cett, Henry (1833–1884), an English politician and economist, b. at Salisbury. He was educated at Cambridge, studied law for a while at the Middle Temple, but soon renounced it. He gave his attention to economic studies. In 1863 he was elected to the chair of political economy at Cambridge. In 1865 he was elected M. P. for Brighton, which he represented till the general election of 1874, when he was elected for Hackney. He became postmaster general in the second Gladstone administration, and effected many reforms in his department. In 1883 he was made lord rector of Glasgow University. He d. Nov. 6, 1884. Among his principal writings are: *A Manual of Political Economy*, *Lectures on the Economic Position of the British Laborer*, and articles on Indian finances.

Fayal (fī-ăl'), an island belonging to Portugal, one of the Azores. It is of a circular form, about 10 mi. in diameter. The climate is good, and the air always mild and pure. The soil is very fertile, producing in abundance wheat, maize, flax, and almost all the fruits of Europe. It exports a great quantity of oranges and lemons. The chief place is Villa Horta, or Orta. Pop. 31,000.

Fayette, General la. See *Lafayette.*

Fayoum (fä-yöm'), a province of Middle Egypt, a little to the west of the Nile surrounded by the Libyan desert; area about 800 sq. mi. Fayoum is irrigated by canals coming from the canal of Joseph, and that from the Nile, and is one of the most fertile provinces of Egypt. Here lay the ancient Labyrinth and the artificial lake, Moeris. The chief town, Medinet-el-Fayoum, is connected with Cairo by a railway. Pop. of province, 228,709.

Feather grass, a native of dry places in the s. of Europe. The leaves are rigid, setaceous, grooved; the awns exceedingly long, feathering to the point. The rush-leaved feather grass is found on prairies in the Western states.

Feathers, the form which the dermal appendages assume in birds, agreeing in mode of development, but differing in form from hairs

FEATHERS. (Birds of Paradise). 1. Red Bird of Paradise. 2. Lophorina superba (magnificent Bird of Paradise). 3. Schlegelia Wilsoni (discovered by Wilson). 4. Semeoptera Wallcei (standard wing). 5. Paradisea

Feather from the back of *Argus giganteus*.
a.—shaft (rachis); *b.*—barbs forming the vexillum, removed from one side of both shaft and undershaft; *c.*—barbules on the barbs; *d.*—aftershaft.

and scales. The feather consists of a stem, horny, round, strong, and hollow in the lower part, called the *quill*, and in the upper part, called the *shaft*, filled with pith. On each side of the shaft is a web composed of a series of regularly arranged fibers called *barbs*. The barbs and shaft constitute the *vane*. On the edges of the barbs are set the *barbules*, which interlock with those of adjacent barbs, and thus give strength to the vane. Feathers are generally divided into two kinds, quill feathers in the wing or tail, and plumes or clothing feathers generally diffused. The feathers of birds are periodically changed, generally once, but in some species twice a year. This is called *molting*. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next moulting season, when the old stumps are shed and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks or even days. The feather is rendered almost impervious to wet by the oily fluid which most birds secrete at the base of the tail. Feathers form a considerable article of commerce, particularly those of the ostrich, heron, swan, peacock, goose, etc., for plumes, ornaments, filling of beds, pens, etc. The most expensive feathers are those of the "ferwah," a rare and beautiful bird of paradise species, which frequents the haunts of the tiger, and therefore cannot be captured without great danger.

Feb′ruary (from the Roman *Februa*, a festival of expiation or purification), the second month in the year, having twenty-eight days, except in leap year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal to July in number of days.

Federal Party (or Federalists), a name assumed by that portion of the people of the U. S. who favored the adoption of the Federal constitution and sought to increase the powers of the national government. They advocated a government having attributes of sovereignty, operating upon the people directly, and having all necessary powers for effective action; their opponents favored a simple compact of confederation. They came into power in 1797 with the election of John Adams to the presidency; and were broken up in 1817.

Federal Government, government by the confederation of several united states, self-governing in local matters, but subject in matters of general polity to a central authority, as, for instance, the U. S., the Swiss Republic, Mexico, etc. The degree to which such states give up their individual rights as sovereign bodies may be very different.

Federalist, The, a collection of essays favoring the adoption of the Constitution of the U. S.; written by Hamilton, Jay, and Madison. It was called, "the political classic of the United States."

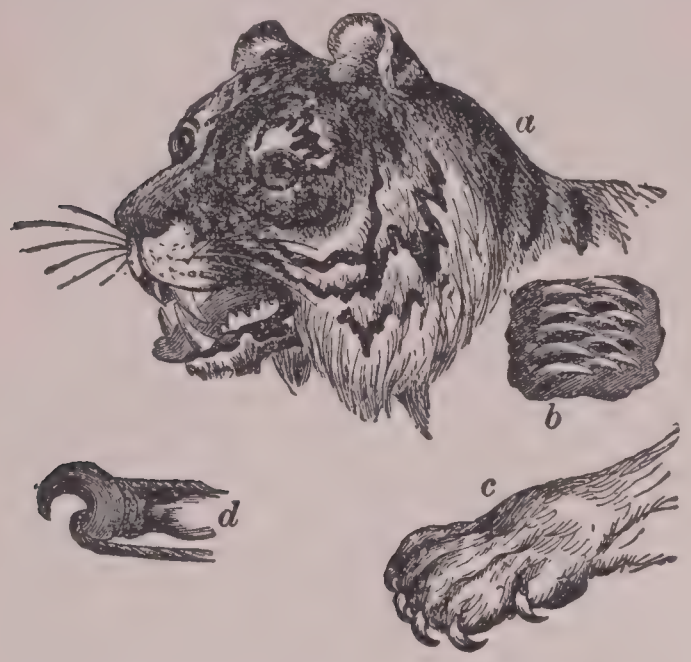
Fee (or Fief), in law, primarily meant a loan of land, an estate held in trust on condition of the grantee giving personal or other service to the prince or lord who granted it. Feudal estates, however, soon came to be regarded as inalienable heritages held on various tenures; hence the term fee came to be equivalent to an estate of inheritance, that is, an interest in land which passes to heirs if the owner die intestate. The amplest estate or interest in land is that of a *fee-simple*, which is also called an absolute fee, in contradistinction to a fee limited or clogged with certain conditions.

Feeling is properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It is the most universal of the senses, existing wherever there are nerves; and they are distributed over all parts of the body, though most numerous on such parts as the finger tips and the lines where skin and mucous membrane pass into each other. The structures which thus apprehend the impressions of contact are papillæ or conical elevations of the skin in which the nerves end, and which are richly supplied with blood-vessels. The term feeling is also used for a general sense of comfort or discomfort which cannot be localized, and it is thus that the disturbances of internal organs often manifest themselves. In a figurative sense the term is also applied to a mental emotion, or even to a moral conception; thus we may speak of a friendly feeling, a feeling of freedom.

Felegyhaza (fā′led-yä-så), a town of Hungary, 66 miles s.e. of Budapest, with large cattle markets and an extensive trade in corn, wine, and fruit. Pop. 23,912.

Fe′lidæ, animals of the cat kind, a family of Carnivora in which the predaceous instincts reach their highest development. They are among the quadrupeds what the Falconidæ are among the birds. The teeth and claws are the principal instruments of the destructive energy in these animals. The incisor teeth are equal; the third tooth behind the

large canine in either jaw is narrow and sharp, and these, the carnassial or sectorial teeth, work against each other like scissors in cutting flesh; the claws are sheathed and retractile. They all approach their prey stealthily, seize it with a spring, and devour it fresh. The species are numerous in Europe, Asia, Africa,



Characteristic Features of the Felidæ.
a.—tiger's head; *b.*—portion of tongue; *c.*—right fore paw, showing claws; *d.*—claw, showing tendons. For dentition see article Carnivora.

and America, but none are found in Australia. The family comprehends the lion, tiger, leopard, lynx, jaguar, panther, chetah, ounce, serval, ocelot, cat, etc.

Fellah, an Arabian word meaning "peasant," and used for the laboring class in Egypt. The fellahs or *fellaheen* constitute about three fourths of the population of Egypt, and are mostly the direct descendants of the old Egyptians, although both their language and religion are now that of their Arabian conquerors. They live in rude huts by the banks of the Nile, and have suffered much from overtaxation and oppressive rule. See *Egypt.*

Fella′tah (Fulbe, or Fulahs), a remarkable African race of the negro type, the original locality of which is unknown, but which is now widely diffused throughout the Soudan, where they are the predominant people in the states of Futa-Toro, Futa-Jalon, Bondu, Sokoto, etc. Though of the negro family, they have neither the deep jet color, the crisped hair, flat nose, nor thick lips of the negro. In person they are decidedly handsome, and mostly of a light copper color. They are shrewd, intelligent, and brave, and are mostly Mohammedans. Their influence is continually spreading.

Fellowship, an honorable position in some universities, both in the U. S. and England, which entitles the holder, called a fellow, to an annual stipend for a certain period. Fellowships in the English colleges commonly range in value from about $750 to $1,250 or $1,500 a year, and they all confer upon their holders the right to apartments in the college, and certain privileges as to commons or meals. Formerly they were usually tenable for life or till the attainment of a certain position in the

church or at the bar, or till marriage; but six or seven years is now a common period during which they may be held, though this may be prolonged in certain circumstances.

Felo de se (Latin, "a felon in regard to himself"), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. Formerly, in England, the goods of such a person were forfeited to the crown, and his body interred in an ignominious manner; that is, unless the coroner's jury gave a verdict of unsound mind; but these penalties have been abolished.

Fel′ony, in law, includes generally all crimes below treason and of greater gravity than misdemeanors. Formerly it was applied to those crimes which entailed forfeiture of lands or goods as part of the punishment.

Fel′spar (Feldspar), a mineral widely distributed, and usually of a foliated structure, consisting of silica and alumina, with potash, soda, or lime. It is a principal constituent in all igneous and metamorphic rocks, as granite, gneiss, porphyry, greenstone, trachyte, felstone, etc. When in crystals or crystalline masses it is very susceptible of mechanical division at natural joints. Its hardness is a little inferior to that of quartz. There are several varieties, as common felspar or orthoclase, the type of an acid group containing from 7 to 16 per cent. of potash; albite and oligoclase, soda felspars, the quantity of soda exceeding that of lime; labradorite and anorthite, lime felspars, the quantity of lime in the latter amounting to 20 per cent.

Felt, a kind of cloth made of wool, or of wool and cotton united by rolling, beating, and pressure. The materials to be felted are carded and placed in a machine, where they are kept wet and intimately mixed together by a process of beating. Pressure then unites the whole into a compact mass. The use of felt as a material for hats, tents, cloaks, etc., is very ancient. For hat making the fur of rabbits, beavers, raccoons, and the wool of sheep is generally used. Felt being a good non-conductor of heat is much used for roofing, sheathing boilers, hot water reservoirs, etc. The felt for such purposes is made from the coarsest woolen refuse from paper mills.

Feluc′ca, a long, narrow vessel, generally undecked, of light draught, and rigged with large lateen-sails. They also carry from eight to twelve large oars. They are common in the Mediterranean.

Feme Covert, in law, signifies a married woman, in contradistinction to a *feme sole*, or single woman.

Femern (fā′mẽrn), an island of Prussia, province of Schleswig-Holstein, separated from the mainland by a shallow strait about 1 mi. broad. The island has a fertile but marshy soil. The inhabitants are chiefly agriculturists and fishers. Pop. 9,800.

Fe′mur, in vertebrate animals, the first bone of the leg, situated next the trunk of the body, and in man popularly called the thigh-bone.

Fen, a marsh or stretch of wet, boggy land often containing extensive pools. The *Fens*,

or the *Fen District*, is a special term for marshy districts in England. Much of the land has been reclaimed at a vast expense. The soil of fen lands is generally black and rich to a depth of 2 or 3 ft., and with proper management in the matter of draining they will produce heavy crops of grass and corn.

Fences, continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. Live fences are made of hawthorn, holly, box, beech, etc.; dead fences of stone, wood, and in recent times of iron or wire. In agriculture fences are necessary both for restricting the tenant's own animals to their pasture, and for protecting his land from straying animals. The general erection of fences on farms is one of the improvements of modern agriculture.

Fencing, the art of attack and defense with sword or rapier, no shield being used. It was in Italy in the sixteenth century that the skillful use of the small sword first became common. The art spread to Spain and then to France, where, on account of the prevalence of dueling, it was brought to a high degree of development. The small sword or rapier (which was adopted for dueling) has a point, but no edge, and therefore demands the highest degree of adroitness in its use. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel and has a button at the end in place of a point.

Since the introduction of the bayonet, bayonet exercise has become an important department of fencing in the army. In handling the bayonet defensively the right foot is thrown back and receives most of the weight of the body, the knees are bent, the bayonet brought to a horizontal position level with the waist. This is the "guard," and according to the parry to be made the weapon is carried either to the "high" position, pointing upward from the breast, or to the "low" position, pointing downward from the breast. In taking the offensive the right leg is straightened, and the left bent forward, without moving the feet from their place. The butt of the rifle is pressed firmly to the shoulder and points straight forward. In "shortening arms" the butt is carried back to the full extent of the right arm, while the barrel (turned downward) rests upon the left arm. The body rests upon the right leg, which is slightly bent, while the left is somewhat advanced.

Fe'nians, a name usually derived from Fionn, or Finn, the name given to a semi-mythical class of Irish warriors famous for their prowess. The name has been assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was regularly organized in America and its chief council consisting of "head center," John O'Mahony, and five other members, which had its seat at New York, soon had branches in every state of the Union; while at the same time large numbers joined the cause in Ireland, where James Stephens was "head center." The close of the American Civil War, when large numbers of trained Irish soldiers who had taken part in the war were released from service, was thought to be a convenient time for taking some decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measure of the British government, the first, in September, 1865, by the seizure of the office of the *Irish People*, the Fenian journal published at Dublin, in which papers were found which revealed to the government the secrets of the conspiracy, and which led to the capture of the ringleaders, Luby, O'Leary, O'Donovan Rossa, and others; the second, in February, 1866, was as speedily suppressed by the suspension of the Habeas Corpus Act in Ireland. An invasion of Canada, attempted in the same year, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the U. S. on which they hitherto counted. At last, on March 5, 1867, the long prepared insurrection broke out almost simultaneously in the districts of Dublin, Drogheda, and Kerry. The number of insurgents in the field, however, did not exceed 3,000, and though they burned some police stations, they nowhere faced the troops sent after them. About the same time some forty or fifty Irish-Americans landed in a steamer near Waterford, but soon after fell into the hands of the police. In 1870 and 1871 two raids were again made on Canada, but both were ridiculous failures, the first being repulsed by the Canadian Volunteers, and the second suppressed by the U. S. government. At present the brotherhood seems to have suspended active operations.

Fennec, a small animal allied to the dog and fox, and sometimes called the Sahara fox, being a native of that region. It lives on birds, jerboas, lizards, dates, etc., burrows with great facility, and is easily tamed. It is fox-like in appearance, and is remarkable for the great size of its ears.

Fennel; *a*.—flower.

Fennel, a fragrant plant, cultivated in gardens, belonging to the natural order Umbelliferæ. It bears umbels of small, yellow flowers, and has finely divided leaves. The fruit,

or in common language, the seeds, are carminative, and frequently employed in medicine. *Giant fennel* is a popular name for *Ferula communis*, which attains sometimes a height of 15 ft.

Fe′odor, the name of three Russian princes. Feodor I, son of Ivan the Terrible, reigned from 1584–98. He was a feeble prince, who allowed himself to be entirely governed by his brother-in-law, Boris Godunov. With him the Russian dynasty of Rurik became extinct. Feodor II, son of Boris Godunov, reigned only for a short time in 1605. Feodor III, the son of Czar Alexis, reigned from 1676–82, warred with the Poles and Turks, and, by the peace of Baktschisarai, obtained possession of Kiev and some other towns of the Ukraine.

Feoffment (fef′ment), in law, that mode of conveying property in land where the land passes by livery in deed, that is, actual delivery of a portion of the land, as a twig or a turf; or when the parties, being on the land, the feoffer expressly gives it to the feoffee. As the statute of uses has introduced a more convenient mode of conveyance, feoffments are now rarely used except by corporations.

Feræ naturæ ("of a wild nature"), the name given, in the Roman law, to beasts and birds that live in a wild state, as distinguished from those which are tame animals, such as horses, sheep, etc. The right of property in such animals exists only as long as they are in a state of confinement or within the boundaries of the possessor's lands, unless it can be proved that any special animal had been trained to return to its master's property.

Fer-de-lance (fer-de-läns), the lance-headed viper, a serpent common in Brazil and some of the West Indian Islands, and one of the most terrible members of the rattlesnake family. It is 5 to 7 ft. in length. The tail ends in a horny spine which scrapes harshly against rough objects but does not rattle. Its bite is almost certainly fatal.

Fer′dinand, German emperors: 1, Ferdinand I (1503–1564), brother of Charles V and b. at Alcala, in Spain. In 1522 he received the Austrian lands of the house of Hapsburg from the emperor, to which were afterward added the kingdoms of Hungary and Bohemia in right of his wife, Anna of Hungary. On the abdication of Charles he succeeded to the imperial title. 2, Ferdinand II (1578–1637), succeeded his uncle Matthias as emperor of Germany in 1619. He was of a dark and reserved character, and had been brought up by his mother and the Jesuits in fierce hate of Protestantism. The result was a quarrel with his Bohemian subjects, who openly revolted and offered the Bohemian crown to the Elector Palatine, a step which led to the outbreak of the Thirty Years' War (1619). With the help of the Catholic League and John George, elector of Saxony, he was placed firmly on the throne of Bohemia, where he relentlessly persecuted the Protestants. 3, Ferdinand III (1608–1657), son of the preceding, succeeded his father in 1637. He had served in the Thirty Years' War, and had seen the miseries which it had occasioned, and was reluctant to continue it. There were eleven years more of it, however, before the peace of Westphalia was concluded in 1648.

Ferdinand V (1453–1516), king of Aragon, who received from the pope the title of *the Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II. On Oct. 18, 1469, he married Isabella of Castile, and thus brought about that close connection between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to pre-eminence among European states. After a bloody war of ten years they conquered Granada from the Moors (1491); but the most brilliant event of their reign was the discovery of America which made them sovereigns of a new world.

Ferdinand I, of Bourbon, king of the Two Sicilies (previously Ferdinand IV, of Naples) (1751–1825), was the third son of Charles III, king of Spain, whom he succeeded in 1759 on the throne of Naples, on the accession of the latter to that of Spain. In 1768 he married Maria Caroline Louisa, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. After the death of Louis XVI Ferdinand joined the coalition against France, and took part in the general war from 1793 to 1796; but in 1799 after the defeat of the Neapolitans under General Mack, the French took possession of the whole kingdom, and proclaimed the Parthenopean Republic. The new republic did not last long. Ferdinand returned to Naples in 1800. Six years later he was again driven from Naples by the French, and compelled to take refuge in Sicily, where he maintained himself by the aid of the British. The Congress of Vienna finally re-established Ferdinand IV in all his rights as king of the two Sicilies, in 1814, while Naples was still occupied by Murat. But after the flight of the latter in March, 1815, Ferdinand once more entered Naples, June 17, 1815. In 1816 he assumed the title of Ferdinand I, king of the Two Sicilies. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new and more liberal constitution. The Austrians, however, came to his help, and re-established him in possession of absolute power. He was succeeded by his son Francis I.

Ferdinand II, king of the Two Sicilies (1810–1859), succeeded his father Francis I, Nov. 8, 1830. The revolution of France in this year had unsettled the minds of men throughout the Continent generally, and Ferdinand was at first forced to make some concessions to his subjects, but soon recalled them, determining henceforward to make his will the only law. The result was a series of popular outbreaks, culminating in the year 1848, when King Ferdinand earned the nickname of King Bomba, by bombarding his capital from the forts. Despotism was again established by force of arms, and when Bomba died his prisons were crowded with the best and bravest of his subjects. His son, Francis II, lost his crown when Italy was united in 1860 under Victor Emmanuel.

Ferdinand VII, king of Spain (1784–1833), eldest son of Charles IV, and of Maria Louisa of Parma; ascended the throne in March, 1808, when a popular rising forced his father to abdicate in his favor. A month later he himself abdicated in favor of Napoleon, who conferred the crown on his brother Joseph. Ferdinand returned to Spain in March, 1814. His arbitrary conduct caused an insurrection in 1820, which was at first successful, but Louis XVIII of France having sent an army to his aid, his authority was once more made absolute in Spain. Having no sons he abolished the act of 1713 by which Philip V had excluded women from the throne of Spain, and then left his crown to his danghter Isabella to the exclusion of his brother Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

Fer'etory, a kind of box made of gold or other metal, or of wood variously adorned, and usually in the shape of a ridged chest; with a roof-like top, for containing the relics of saints. It is borne in processions.

Ferghana', a province of Asiatic Russia in Turkestan, formed in 1876 out of the conquered khanate of Khokand. It consists mainly of a valley surrounded by high mountains and traversed by the Sir-Darya and its tributaries; area 36,000 sq. mi. The climate is warm, and the soil in part fertile, but a considerable portion of the country is desert. Pop. about 716,000. Khokand is the capital.

Ferguson, James (1710–1776), an eminent experimental philosopher, mechanist, and astronomer, was b. of poor parents at Keith, in Banffshire. While a boy tending sheep he acquired a knowledge of the stars, and constructed a celestial globe. With the help of friends he went to Edinburgh, where he studied mathematics and drawing, making such rapid progress in the latter that he was able to support himself by taking portraits in miniature. In 1743 he went to London, where he painted and gave lectures in experimental philosophy. Among his hearers was George III, then Prince of Wales, who afterward settled on him a pension of $250 a year. His principal works are: *Astronomy Explained upon Sir Isaac Newton's Principles* (1756); *Lectures on Mechanics, Hydrostatics, etc.* (1760); *Select Mechanical Exercises* (1773).

Fergusson, Robert (1750–1774), a Scottish poet of distinguished merit, was b. at Edinburgh. He wrote many poems, of which those in the Scottish dialect have genuine poetic excellence. He was buried in the Canongate Churchyard, Edinburgh, where Burns erected a monument to the memory of this kindred genius, to whom he owed suggestions for several of his own poems.

Ferish'ta (1550–1612), more properly Mohammed Kasim, a Persian historian, b. at Astrabad. He went to India with his father, and was for some time the tutor of a native prince. He wrote a history of the *Mohammedan Power in India,* which is the best yet written on the period which it embraces.

Fermanagh (fer-mä'nȧ), an inland county in Ireland, in the province of Ulster; area 714 sq. mi., or 457,369 acres. Pop. 74,037.

Fermentation, the spontaneous conversion of an organic substance into new compounds by the influence of a ferment; these ferments being apparently vegetable organisms of extremely simple type, which by their life, growth, and increase set up fermentation. There are several kinds of fermentation: 1, the *vinous* or *alcoholic* fermentation — the most important from an economic and industrial point of view — in which the sugar contained in liquids is converted into alcohol, carbonic acid, and glycerine; 2, the *acid* fermentation, in which spirituous liquors become acid, producing acetic acid; 3, the *putrid* fermentation, by which organic substances undergo various alterations according to the nature of the substance, and generally set free poisonous gases. Fermentation is also described as lactic, butyric, etc., according to the nature of the results. The general course of alcoholic fermentations, as seen in brewing and wine making, is as follows: After a lapse of time, which may vary much according to the temperature and other conditions, the liquid acquires a turbid appearance, there is a slight disengagement of gas, which increases till the liquid begins to effervesce, its temperature rises to a higher point than that of the surrounding air, and its surface becomes covered with a frothy matter known as yeast. The effervescence becomes more and more violent till a climax is reached, when its intensity gradually diminishes, and the disengagement of gas ceases. The yeast then settles down at the bottom of the liquor, which is now entirely deprived of its sugar, and has the characteristic taste and effects of "fermented liquors." The rationale of this process has long been the subject of much discussion, but there can be little doubt that it is due to microscopic organisms (the yeast fungi) which live and multiply in the liquid in which they cause fermentation. And the fermentation may be checked or altogether prevented by anything which prevents the growth of the fungus, for example, by the presence of any antiseptic substance such as sulphuric acid, carbolic acid, etc., which acts as a poison on the fungus; or by the liquid being either too hot or too cold (below 50° or above 86° F.). Fermentation differs in kind according to the nature of the substance which produces it, and each kind is the special production of a certain species of organism, no two of which will ever pass into each other. *Lactic fermentation,* such as occurs in milk that has been allowed to stand, is caused, according to Pasteur, by the development in the mass of a microscopic fungus, the sugar of the milk being converted into lactic acid. The *acid fermentation* occurs in liquids which have already undergone vinous fermentation. When exposed to the atmosphere such liquids become sour, and vinegar is produced. *Viscous fermentation* often accompanies vinous fermentation, making the wine thick and viscous so that it

runs out in threads when poured. It occurs at temperatures ranging from 68° to 104° F. *Butyric fermentation* follows on lactic fermentation when the latter is allowed to proceed after lactate of lime has been formed. It is believed that putrefaction is only a species of fermentation, determined by ferments of the bacteria class. As it is commonly maintained that fermentation may be set up by the necessary germs entering the liquors from the air in which they float, the theory of fermentation has a close connection with that of the germ theory of disease.

Ferment'ed Liquors, alcoholic beverages obtained by the fermentation and clarification of saccharine fluids. These have been in use from the earliest times. Among the commonest kinds are *wine* made from the juice of the grape; *ale* or *beer* made from an infusion of malt; *cider*, from apples; *mead*, from honey; *kumiss* made by the Kirghiz from mares' milk; *chica*, from maize by the South American Indians, etc. From all fermented liquors a spirit may be extracted by distillation.

Fer'ments, certain substances, which, under particular conditions, excite fermentation. Some are of inorganic nature, but the most important are organic. See *Fermentation.*

Fernan'do de Noronha (no-ron'yà), a small island in the Atlantic, forming one of a small group of the same name, about 210 mi. from the coast of Brazil, to which it belongs, and by which it is used as a penal settlement.

Fernan'do Po, a Spanish island in the Bight of Biafra, off the west coast of Africa, about 20 mi. from the mainland. It is of volcanic origin, and is of an oblong form, broadest at the south extremity, 35 mi. long and 22 mi. broad. It is traversed from north to south by a ridge of mountains terminating in a magnificent cone, 11,040 ft. high, called Clarence Peak. The population is about 20,000, partly a mixture of negroes, Portuguese, and other Europeans, partly native-born negroes. The capital is Clarence Town.

Ferns, a natural order of cryptogamous or flowerless plants, forming the highest group of the acrogens or summit growers. They are leafy plants, the leaves, or more properly fronds, arising from a rhizome or root stock, or from a hollow, arborescent trunk, and being circinate in vernation, a term descriptive of the manner in which the fronds are rolled up before they are developed in spring, having then the appearance of a bishop's crosier. Ferns have a wide geographical range, but are most abundant in humid, temperate, and tropical regions. In the tropical forests the tree ferns rival the palms, rising sometimes to a height of 50 or 60 ft. Ferns are very abundant as fossil plants. The earliest known forms occur in Devonian rocks. Various systems of classification for ferns have been proposed. At present the order is usually divided into six or eight suborders or tribes distinguished by differences in the structure of the sporangium.

Ferra'ra, a city of n. Italy, capital of the province of same name, 26 mi. n.n.e. Bologna, in a fertile but unhealthy plain. It is a well-built town, with many remains of the splendor and commercial prosperity it enjoyed under the house of Este. Under the papal rule it fell into decay, and has now a deserted appearance. The old ducal castle or palace (now occupied by public offices), several other palaces, the cathedral, the public picture gallery, the houses where Ariosto and Guarini lived, the cell in which Tasso was imprisoned, a monument to Savonarola, who was born here, are among the many interesting monuments which Ferrara contains. Pop. 28,814. The province was formerly a duchy of Italy held by the House of Este as a papal fief from 1471 till 1597, when it fell to the pope. Area 1,100 sq. mi.; pop. 230,807.

Ferreira (fer-ā'i-rà) (1528–1569), Antonio, Portuguese poet, b. at Lisbon. He carried to perfection the elegiac and epistolary style, and added to Portuguese poetry the epithalamium, the epigram, ode, and tragedy. His tragedy of *Ines de Castro* is still considered by the Portuguese as one of the finest monuments of their literature.

Fer'ret, a carnivorous animal closely allied to the polecat, 14 in. in length, of a pale yellow color, with red eyes. It is a native of Africa, but has been introduced into the U. S. and Europe. It cannot, however, bear cold, and cannot subsist even in France except in a domestic state. Ferrets are used for hunting rabbits and for killing rats and mice. When in captivity, they are fed on raw meat, bread, and milk.

Ferret.

Fer'rier, James Frederick (1808–1864), a Scotch metaphysician, b. at Edinburgh. His contributions to *Blackwood's Magazine*, then at the height of its fame, brought him into notice, and in 1845 he was appointed to the chair of moral philosophy of St. Andrews. His chief work is the *Institutes of Metaphysics.*

Ferrier, Susan Edmonston (1782–1854), novelist, the aunt of the preceding, was b. in Edinburgh. Her principal works are: *Marriage*, *The Inheritance*, and *Deserting; or the Chief's Daughter.*

Ferris Wheel. The largest wheel ever constructed, was designed and constructed by G. W. C. Ferris (1858–1896), a Pittsburg engineer. The wheel was composed of two wheels of the same size connected by rods and struts. At the center of the wheel was an axle 45 ft. in length and 32 in. in diameter. The spokes of the wheel were iron rods 2½ in. in diameter arranged in pairs 13 ft. apart at the crown connection. On the periphery were hung 36 cars, each having a seating capacity of 40

passengers. The total weight of the wheel was about 1,100 tons. The wheel was 250 ft. in diameter and elevated 14 ft. above the ground, making a total height of 264 ft. The total cost of the wheel was about $300,000. At the close of the Fair it was taken down and removed to north Clark St., Chicago, where it now stands.

Ferro (or Hierro), the most southwestern and smallest of the Canary Islands, about 18 mi. long and 9 mi. broad. This island having once been supposed the most western point of the Old World, was formerly employed by all geographers to fix their first meridian, and the longitude reckoned from it.

Ferrol′, a fortified seaport of Northern Spain, in the province of and about 12 mi. n.e. of the town of Coruña, on a fine inland bay, connected with the sea by a channel so narrow as to admit only one ship-of-the-line at a time. The chief naval arsenal of Spain, established on a magnificent scale, is here. The manufactures consist chiefly of swords, cutlery, and military and naval equipments. Pop. 23,811.

Ferry, a particular part of a river, lake, arm of the sea, etc., where a boat or other conveyance plies to carry passengers or goods from the one side to the other. The right of establishing a public ferry is usually the prerogative of a government or legislature. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. No one will be allowed to establish a rival ferry so near the original one as to destroy its custom. Common rowing boats, sailing boats, large, flat-bottomed barges pulled along a rope stretched from bank to bank for horses and carriages, and steam ferryboats, are among the conveyances.

Ferry, Jules François Camille (1832–1893), French statesman and writer, b. at St. Dié in the Vosges. He became a barrister at Paris, but devoted himself almost entirely to journalism. His articles in the *Presse*, *Courrier de Paris*, and *Temps*, from 1856 to 1869, brought him much into notice, and in 1869 he was returned as deputy for the sixth arrondissement of Paris and took his seat among the members of the "Left." After the fall of Sedan he became a member of the Government of the National Defense. In 1872 Thiers appointed him minister-resident at Athens. In 1879 he became minister of public instruction, and as such introduced an education bill, which among other things forbade unauthorized communities, such as Jesuits, to teach in schools. In 1880, Ferry, having become premier, entered upon a vigorous and somewhat hazardous foreign policy. His seizure of Tunis in 1881 was so far successful, though it led to his resignation; again premier in 1883 his unfortunate expedition to Tonquin forced him to retire from office. Feb. 24, 1893, he was elected president of the Senate, but died the same year.

Fer′ula, a genus of umbelliferous plants, whose species often yield a powerful stimulating gum resin, employed in medicine. The species are natives of the shores of the Mediterranean and Persia, and are characterized by tall-growing pithy stems, and deeply divided leaves, the segments of which are frequently linear.

Fescen′nine Verses, rude Latin verses in the form of a dialogue between two persons, who satirized and ridiculed each other's failings and vices with great freedom of speech. They originated in country districts in ancient Italy, but were ultimately introduced into the towns, and formed a favorite amusement at marriages and on other occasions of festivity.

Fesch (fesh), Joseph (1763–1839), half-brother of Napoleon's mother, was b. at Ajaccio. He had devoted himself to an ecclesiastical life, but quitted it on the outbreak of the French Revolution, and became commissary of war to the army of the Alps. After the restoration of Catholic worship he resumed his ecclesiastical status and became in 1802 Archbishop of Lyons, and next year a cardinal. After the fall of Napoleon he retired to Rome, where he died.

Fesse (fes), in heraldry, a band or girdle comprising the center third part of the shield, and formed by two horizontal lines drawn across it; it is one of the nine honorable ordinaries. The fesse point is the exact center of the escutcheon.

Fes′tivals (or Feasts), certain days or longer periods consecrated to particular celebrations either in honor of some god, or in commemoration of some important event. Such festivals have prevailed among nearly all nations, both ancient and modern. Among the Jews there are six festivals prescribed in the Scriptures (Leviticus 23), and thence called sacred feasts. Among the ancient Greeks were celebrated the Dionysia; the Eleusiania; the four great national games, the Olympic, the Isthmian, Nemean, and Pythian games. But each community and city had its own local festivals in addition, such as the Panathenæa, held by the tribes of Attica, whose union it was intended to celebrate. Among Roman festivals were the Saturnalia, Cerealia, Lupercalia, and others.

The saints' days, that are still held as festivals, and have religious services connected with them in the Church of England, are called *red-letter* days, because they used to be printed with red letters in the church calendar (hence the expression, "Red-letter day"); while the saints' days which were still retained in the calendar at the Reformation, but had no services connected with them, are called *black-letter* days, because they were printed in black letters.

Festus, Porcius, Roman procurator of Judea 61–62 A. D., successor of Felix. The apostle Paul appeared before him, and was sent by him to Rome at his own request.

Festus, Sextus Pompeius, a Roman grammarian belonging to the second or third century of our era, author of an abridgment of a

work by Verrius Flaccus called *De Verborum Significatione*, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The one MS. of the original work of Festus is now at Naples.

Fe'tish (or fetich), a word first brought into use by De Brosses, in his work *Du Culte des Dieux Fétiches* (1760), and derived from the Portuguese *feitiço*, magic, a word which expressed the Portuguese opinion of the religion of the natives of the west coast of Africa. The Portuguese gave this name to the idols of the negroes of the Senegal, and afterward the word received a more extensive meaning. A fetish is any object which is regarded with a feeling of awe, as having mysterious powers residing in it, but without any consciousness in the exercise of them. The fetish may be animate, as a cock, a serpent, etc.; or inanimate, as a river, a tooth, a shell. Fetish worship prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

Feudal System, that system by which land (a *fief*) is held by a vassal on condition of fidelity, that is, in consideration of services to be rendered to his superior or feudal lord. The nature of the feudal system is to be explained by its origin among the Germanic tribes. In the earliest times the relation of superior and vassal did not exist in connection with the ownership of land. Each freeman had his share of the tribe lands, which were held simply on condition of his fulfilling his public duties of attendance at the councils of the mark or township and performing his share of military service in the wars or musters decreed at such councils. The noble had, of course, more land and more influence than the simple freeman, but there need be no tie of vassalage between them. This seems to have been the primitive social organization of the Anglo-Saxons and other German tribes. The lands held by all freemen, whether noble or ordinary freemen, under this system, are said to be *allodial*, as distinguished from *feudal* lands, which imply service to a superior lord. By the close of the tenth century, however, this system had undergone considerable modifications. The masses of Teutonic invaders who overran Gaul and England had necessarily to confer exceptional powers on their leaders; and as they were for long very much in the position of military in an enemy's country, these powers were naturally continued. Thus it was that kings, before unknown to the Anglo-Saxons, made their appearance immediately after their descent upon Britain. It was common for a chief, or great man, to have a retinue or bodyguard composed of valiant youths, who were furnished by the chief with arms and provisions, and who in return devoted themselves to his service. These companions originally received no pay except their arms, horses, and provisions, and the portion of the spoils which

remained after the chieftain had taken his own share. But when conquered lands came to be apportioned and large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants on the same terms. As the son commonly esteemed it his duty, or was forced by necessity to devote himself to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right and the fief became hereditary. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. Thus a feudal nobility and a feudal system arose and for a time existed alongside of the old allodial system. But gradually the greater security to be got by putting one's self under the protection of some powerful ruler or leader gave the feudal system the predominance. The free proprietor of landed property, oppressed by powerful neighbors, sought refuge in submitting to some more powerful nobleman, to whom he surrendered his land, receiving it back as a vassal. Even the inferior nobility found it to be to their advantage to have themselves recognized as feudatories of the nearest duke or earl; and as the royal power steadily advanced, the offices of duke, ealderman, gerefa, etc., were always bestowed by the king. Thus the crown became the source of all authority and possession in the country. The land which had once been "folcland," or the land of the people, became the land of the king, from whom all titles to it were held to be derived. Such at least was the development of feudalism in England, where its centralizing tendencies, especially in the matter of holding land from the crown, were strongly reinforced by the circumstances of the conquest under William the Norman. Under him and his immediate successors there was a struggle between royalty and the nobility, which ended in the power of the latter sinking before that of the kings. On the other hand, in Germany, France, and elsewhere on the Continent, the disintegrating tendencies of feudalism as a system of government had full play. In these countries the weakening of the kingly authority encouraged the great feudal dukes and counts to set up in an almost absolute independence, which in France was afterward gradually lost as the monarchy grew stronger, but in Germany continued to divide the land down almost to our own times into a number of petty principalities.

Among the chief agencies that overthrew the feudal system were the rise of cities, the change in modes of warfare, and the spread of knowledge and civilization. The spirit of the feudal system, grounded on the prevalence of

landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. The growth of this new class, with its wealth and industrial importance, has contributed more than anything else to a social and political development before which the old feudal relations of society have almost totally disappeared. Even yet, however, the laws relating to land still bear the stamp of feudalism in various countries. In England, for instance, all land owners are theoretically regarded as tenants holding from some superior or lord, though the lord may be quite unknown.

Feuerbach (foi′ĕr-bȧh), Ludwig Andreas (1804–1872), a German metaphysician, son of the celebrated jurist (see next article), was b. at Landshut in Bavaria. All transcendental ideas, such as God, immortality, etc., Feuerbach came to regard as deleterious illusions, and considered that the direct contact of the senses with things alone gave the full truth. His works include a *Critique of Hegel* (1839); *The Essence of Christianity* (1841; translated by George Eliot, 1854); *The Essence of Religion* (1849); *Godhead, Freedom, and Immortality* (1866).

Feuerbach, Paul Johann Anselm (1775–1833), German criminal jurist, was b. at Jena. In 1801 he became an ordinary professor of jurisprudence at Jena, but the following year accepted a chair at Kiel. In 1804 he obtained an appointment in the University of Landshut, where he was employed to draw up the plan of a criminal code for Bavaria, which received the royal assent in 1813. In 1814 he was appointed second president of the appeal court at Bamberg, and in 1817 first president of the appeal court for the circle of Rezat at Anspach. Among his most interesting and important works are: *Remarkable Criminal Trials*, and *Themis, or Contributions to the Art of Lawmaking.*

Feuillet (*feu*-yā), Octave (1812–1890), a French novelist and dramatist, b. at Sanit Lô, department of Manché, came into notice about 1846 with his novels of *Le Fruit Défendu*, *Le Conte de Polichinelle*, and a series of comedies and tales which were published in the *Revue des deux Mondes.* In 1857 the appearance of *Le Roman d'un Jeune Homme Pauvre* raised Feuillet to the first rank of the novelists of the day. Among his other numerous novels are *Monsieur de Camors* (1867), *Julia de Trécœur* (1872), *Le Sphinx* (1874), *Histoire d'une Parisienne* (1881), etc. His works have a refined humor, and are free, in great part, from the realistic coarseness of the later French school.

Fe′verfew, a common composite biennial, frequent in waste places and near hedges. It has a tapering root, an erect, branching stem about 2 ft. high, and stalked compound leaves of a hoary green color, and ovate cut leaflets. The plant possesses tonic and bitter qualities, and was supposed to be a potent means of driving away fever.

Fez, one of the two capitals of Morocco, 100 mi. e. of the Atlantic and 85 mi. s. of the Mediterranean. It is finely situated on the hilly slopes of a valley, on the river Fez, which divides Old Fez from New Fez. Both parts are surrounded by walls now in very bad repair. The streets are narrow, dark, and extremely dirty; the houses two or three stories high, and without windows to the street. The interiors, however, are often handsome, the courtyard being paved and provided with fountains. There are many mosques, one of them the largest in North Africa. The sultan's palace is a large but somewhat ruinous structure. Fez is a place of considerable commercial importance, being the depot for the caravan trade from the south and east and having extensive dealings with Europe. The manufactures consist of woolen cloaks, silk handkerchiefs, leather, the red caps named *fezes*, carpets, pottery, etc. Fez was at one time famous as a seat of Arabian learning. Fez was founded in 793, and was the capital of an independent state from 1202 to 1548, attaining a high state of prosperity. The population is variously estimated from 50,000 to 150,000.

Common Feverfew.

Fez (from *Fez*, the above town), a red cap of fine cloth, with a tassel of blue silk or wool at the crown, much worn in Turkey, on the shores of the Levant, in Egypt, and North Africa generally. The core or central part of a turban usually consists of a fez.

Fezzan′, a state of North Africa, in the Sahara, forming a depression surrounded by mountain chains and consisting of a great number of small oases. Wheat, barley, millet, figs, melons, and other fruits, tobacco, cotton, etc., are cultivated, but the chief wealth of the country is in its date palms. With exception of goats and camels, and in some districts sheep and cattle, few domestic animals are reared. The natives are a mixed race of Arabs, Berbers, negroes, etc. Fezzan is governed by a lieutenant governor under the governor of Tripoli, and dependent therefore on Turkey. Pop. variously estimated, does not probably exceed 50,000.

Fiacre (fē-ä-kr), in France, a small four-wheeled carriage or hackney coach, so called from the Hotel St. Fiacre, where Sauvage, the inventor of these carriages, established in 1640 an office for the hire of them.

Fibers used in Manufacture.—These may be of mineral, animal, or vegetable origin. In the mineral kingdom a fiber which may be so used has been found in asbestos. Among animal fibers the silk obtained from the cocoons of the silkworm and the wool of the sheep represent two great classes. Of the latter the wool

of the sheep is by far the most importa on account of its length, its fineness, and the comparative ease with which it can be produced in large quantities for the market. Among other animals whose wool or hair is also used to some extent are the goat, especially of the Angora species, the llama or alpaca, the vicuña, the rabbit, the yak, the chinchilla, etc. But the vegetable kingdom furnishes by far the greatest number and variety of fibers for manufacturing purposes. These fibers are obtained either from the sheath of the bark or bast; or from the cellular tissues and pulp of their roots, stems, and leaves; or, in a few plants, from a hairy covering which grows upon the seeds within the pod. Of the first class are flax, hemp, jute, China grass, etc. To the second class belong New Zealand flax, Manilla hemp, coir of cocoanut fiber, from the husk of the cocoanut; Pita flax, etc. To the third class belong cotton, vegetable silk, etc.

Fi′brin, a peculiar organic compound substance found in animals and vegetables. Animal fibrin constitutes the solid matter which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus and other pathological fluids. Fibrin is composed of carbon, nitrogen, hydrogen, and oxygen, and is closely allied to albumen and casein. It is a very important element of nutrition. In healthy venous blood there is about 2.3 per cent, but its percentage is slightly more in arterial blood. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from coloring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances.

Fichte (fiH′tė), Johann Gottlieb (1762–1814), German philosopher. In 1800 he was one of the most prominent professors of the University of Jena, during its most brilliant period. Here he published, under the name of *Wissenschaftslehre* (*Theory of Science*), a philosophical system, which, though founded on Kant's system, gives the latter a highly idealistic development which was strongly repudiated by the Königsberg philosopher.

Fichtelgebirge (fiH′tėl-ge-bir-ge), a mountain range of Germany, in Bavaria; chief summit, Schneeberg, 3,460 ft.

Fiction, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. Thus an heir is held to be the same person as the ancestor to the effect of making the heir liable for the debts of the ancestor. The rules by which the existence of legal fictions are limited have been stated as follows: 1, The fiction must have the semblance of truth. 2, It shall not be used to work a wrong. 3, It shall only be employed for the end for which it was introduced.

Fiddle-wood, a genus of trees or shrubs with some twenty species, natives of tropical America. Some of the species are ornamental timber trees; several yield a hard wood valuable for carpenter work.

Field, in heraldry, the whole surface of the shield on which the charges are depicted, or of each separate coat when the shield contains quarterings.

Field, Cyrus West (1819–1892), an American merchant. Having obtained a charter giving him exclusive right for fifty years of landing ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company. Attempts to lay cables were made in 1857 and 1858, but without permanent success, and the American war having broken out, it was not until 1866 that a cable was successfully laid by the *Great Eastern.* Mr. Field took an active part in establishing telegraphic communication with the West Indies, South America, etc., and was connected with various important enterprises.

Field-cricket, one of the most noisy of all the crickets, larger but rarer than the house-cricket. It frequents hot, sandy districts in which it burrows to the depth of 6 to 12 in., and sits at the mouth of the hole watching for prey, which consists of insects.

Field, David Dudley (1805–1894), lawyer, was b. in Haddam, Conn. He has been especially prominent in the cause of law reform. It has been asserted that Mr. Field has done more for the reform of laws than any other man living.

Field, Eugene (1850–1895), American poet and humorist, b. at St. Louis, Mo. Having lost his mother when but seven years of age, he was reared by a cousin, Miss Mary Field French, of Amherst, Mass. In 1868 he entered Williams College, and in 1869 was transferred to Knox College, Galesburg, Ill. In 1871 he became a student at the Missouri State University, which he left on attaining his majority, and soon afterward made a tour of Europe. On his return to America he found it necessary to turn his attention to earning a livelihood. His taste for journalism led him into that profession. From contributor to the St. Louis *Journal* (1872), he rose to the position of city editor. In 1875 he was connected with the St. Joseph (Mo.) *Gazette,* from which he was transferred to the St. Louis *Times-Journal.* In 1880 he was managing editor of the Kansas City *Times,* and from 1881–1882 he was in Colorado managing the Denver *Tribune.* A series of comic and semi-humorous articles published in his paper brought him into favorable notice. In 1883 he was given charge of a department in the Chicago *Record.* In this capacity he made a reputation as a humorist, by his widely-read column, *Sharps and Flats.* He also came into notice as a lecturer. His propensity for practical joking was well known. Sometimes he would amuse himself by writing verses, sign a friend's name, and after publication, criticise them unmercifully. Some of his verses abound in fine pathos and delicate fancy. *Little Boy Blue,* and *Sometime There Ben a Lyttle Boy,* are fine samples of simple pathos. *The Dutch Lullaby* and *The Ride to Bumpville,* reveal the true poetic in-

stinct. *Seein' Things* and *Jes' Fore Christmas*, reveal the author's sympathy with the heart of the boy. His first published work was *The Denver Tribune Primer* (1882); followed by the *Model Primer*, the same year; *Little Book of Profitable Tales* (1889); *A Little Book of Western Verse* (1890). *Echoes of a Sabine Farm* (1895), was the last published.

Field Glass, a binocular telescope in compact form, usually from 4 to 6 in. long. The name is also given to a small achromatic telescope usually from 20 to 24 in. long, and having from three to six joints.

Fielding, Henry (1707–1754), one of the greatest of English novelists, was b. at Sharpham Park, in Somersetshire, the seat of his father, Gen. Edmund Fielding. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and the same cause, added to a dissipated disposition, turned his attention to the stage. His first dramatic piece was entitled *Love in Several Masks*, was produced at Drury Lane in 1728, and met with a favorable reception. *The Temple Beau*, *The Author's Farce*, *The Modern Husband*, *Don Quixote in England*, and many others quickly followed, a number of them being little more than free translations from the French. About 1736 or 1737 he married Miss Craddock, a lady of some fortune, and at the same time, by the death of his mother, became possessed of a small estate in Dorsetshire. In 1742 the first of his great novels, *Joseph Andrews*, appeared, which he had at first conceived as a burlesque of *Richardson's Pamela*. It was a great success, and was followed by *A Journey from this World to the Next*, and the *History of Jonathan Wild*. In 1749 his masterpiece, *The History of Tom Jones*, appeared, and was followed two years afterward by *Amelia*. The chief merits of Fielding as a novelist are wit, humor, correct delineation of character, and knowledge of the human heart. He drew from a very varied experience of life, which he reproduced with an artistic realism entitling him to be considered, far more than Richardson, as the creator of the English novel.

Field, Kate (1840–1896), b. at St. Louis, Mo. She completed her education at Boston, and made a visit to Europe as correspondent for the New York *Tribune*, Chicago *Tribune*, and Philadelphia *Press*. Later she became an actress. In 1890 she started *Kate Field's Washington*, a personal journal. Among her works are *Biographies*, *Photographs of Charles Dickens's Readings*, *Haphazard*, *Ten Days in Spain*, *History of Bell's Telephone*, etc.

Field Officers, in the army, those competent to command whole battalions — majors, lieutenant-colonels, colonels, as distinguished from those intrusted with company duties, as captains and lieutenants.

Field of the Cloth of Gold, a spot in the valley of Andren, between the English castle of Guisnes and the French castle of Ardres, celebrated for the meeting (June 7, 1520) between Henry VIII, of England, and Francis I, of France, attended by the flower of nobility

of both nations. The diplomatic results were little or nothing, and the event is now memorable only as a grand historic parade.

Fiery Cross, among the Scottish Highlanders, a cross of light wood, the extremities of which were set fire to and then extinguished in the blood of a goat, sent from place to place as a summons to arms. Also known as the *Crantara*.

Fife, a small instrument of the flute kind, pierced with six finger-holes, and usually having one key. Its ordinary compass is two octaves from D on the fourth line of the treble staff upward.

Fife (or Fifeshire), a maritime county, Scotland, forming the peninsula between the Firths of Forth and Tay; extreme length 43 mi.; extreme breadth 17 mi.; area 316,089 acres. Fife is the third largest coal-producing county in Scotland. Iron, limestone, and freestone abound. The chief manufacture of the county is linen, damasks, diapers, checks, ticks, etc.; the first two principally at Dunfermline, the last two at Kirkcaldy. There are salmon and other fisheries. Fife returns two members to the House of Commons, being divided into an eastern and a western division. Pop. 187,320.

Fifth, in music, an interval consisting of three tones and a semitone. Except the octave it is the most perfect of concords. Its ratio is 3:2. It is called the fifth as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic.

Fig, a deciduous tree belonging to the order Moraceæ (Mulberry). It is indigenous to Asia Minor, but has been naturalized in all the countries round the Mediterranean. It grows from 15 to 20, or even 30 ft. high. In congenial cli-

Common Fig; *a.*—fruit; *b.*—section of fruit.

mates it bears two crops in a season, one in the early summer from the buds of the last year; the other (which is the chief harvest) in the autumn, from those on the spring growth. Figs, particularly dried figs, form an important article of food in the countries of the Levant. The best come from Turkey.

Fig'aro, a dramatic character first introduced on the French stage by Beaumarchais

in his comedies, *The Barber of Seville* and *The Marriage of Figaro.* Figaro is a barber remarkable for his shrewdness and dexterity in intrigue. The plays were adapted for Mozart's *Marriage of Figaro* and Rossini's *Barber of Seville.* The name is also well known as that of satirical journals published in Paris and London,

Fighting Fish, a small fish of the family Anabasidæ (climbing perch), a native of the southeast of Asia, remarkable for its pugnacious propensities. In Siam these fishes are kept in glass globes, as we keep goldfish, for the purpose of fighting, and an extravagant amount of gambling takes place about the result of the fights. When the fish is quiet its colors are dull, but when it is irritated it glows with metallic splendor.

Figuier (fē-gi-ā), Louis, a French writer of popular works on science, b. 1819, and latterly professor in the School of Pharmacy, Paris. Among his works are, *Histoire du Merveilleux dans les Temps Modernes; L'Alchimie et les Alchimistes; Vies des Savants Illustre depuis l'Antiquité jusqu'au XIX Siècle; Les Grandes Inventions; Le Tableau de la Nature,* etc. Several of his works have been translated into English, including different sections of the one last mentioned.

Fig'ural (or Figurate) **Numbers,** numbers formed by the terms of arithmetical series of all sorts, in which the first number is always unity. For example:—

I.—1,	2,	3,	4,	5,	6,	etc.
II.—1,	3,	6,	10,	15,	21,	etc.
III.—1,	4,	9,	16,	25,	36,	etc.
IV.—1,	5,	12,	22,	35,	51,	etc.

Those in the second row are called *triangular* numbers, because their units may be arranged in equilateral triangles; the numbers of the third row are called *square* numbers; those of the fourth *pentagonal,* etc.; and so there are also *hexagonal, heptagonal,* and, in general, *polygonal* numbers.

Fiji (Feejee, or Viti) **Islands,** an island group, South Pacific Ocean, e. of the New Hebrides, between lat. 15° 30′ and 19° 30′ s.; and lon. 177° e. and 178° w. The entire group, which was discovered by Tasman in 1643, comprises altogether 254 islands and islets, 80 of which are inhabited; total area about 8,000 sq. mi. The cocoanut palm grows along the seacoasts; the bread-fruit, banana, and pandanus are abundant; the orange, taro, yams, sweet potato, and since the commencement of European settlements, maize, tobacco, and the sugar cane are cultivated; timber trees, including the chestnut, are plentiful; sandal wood is now scarce. The birds are wild ducks, pigeons, the domestic fowl, parrots, and other tropical species. Except the stock introduced there are hardly any animals. Fish are plentiful. The natives enclose and cultivate their lands, the women performing most of the manual labor. The climate on the whole is healthy and agreeable for Europeans. The Fijians are a dark-colored, frizzly-haired, bearded race of Melanesian extraction, although intermixed with the Polynesians of Tonga and Samoa. They are cleanly

in their habits, and are generally regarded as superior to the Polynesians in intelligence. From 1866 onward the influx of European settlers from New Zealand and the Australian colonies gradually brought the trade of Fiji into importance, and repeated applications were made to the British government both by the settlers and the king, Thakombau, to annex the islands. At length in 1874 this was done, and the Fiji Islands were made a crown colony, under a governor, assisted by an executive council and legislative assembly, both either officials or nominated by the governor. Native chiefs take part in the administration, the old customary law being still largely adhered to. Since the annexation the prosperity of the colony has been remarkable. The revenue is between $300,000 and $350,000. The chief article of export is sugar; the next is copra, the dried kernels of the cocoanut. The other important exports are cotton, molasses, coffee, etc. The demand for labor has led to the introduction of some 6,000 coolies from India. The Europeans number about 2,000. The capital is Suva, on the south coast of Viti Levu. The island of Rotumah, to the north, was annexed to Fiji in 1881. Pop. 124,658.

File, a steel tool for abrading or smoothing purposes. Files were known before 1093 B. C. for they are mentioned in 1 Sam. 13 : 21. Files are graded by shape, size, and fineness of cut, and the particular purpose to which it is applied gives a name to a particular file. Three distinct "cuts" of file are recognized; "single-cut," "double-cut" and "rasp." These cuts have different degrees of coarseness, designated by terms as follows:—

Single-cut: rough, coarse, bastard, second-cut, smooth. *Double-cut:* coarse, bastard, second-cut, smooth, dead smooth. *Rasp:* coarse, bastard, second-cut, smooth.

The terms "rough," "coarse," "bastard," "second-cut," "smooth," and "dead smooth" have reference only to the coarseness of the teeth; the terms "single-cut," "double-cut," and "rasp" refer to the character of the teeth. In single-cut files, the coarse grades of which sometimes are called "floats," the teeth are unbroken, the "blanks," (piece of steel of which the file is made) having had but a single course of chisel cuts. Double-cut files have two courses of chisel cuts crossing each other. Rasps differ from single and double-cut files in that the teeth are disconnected, each being made with a single pointed tool, called a punch by file makers. A "safe edge" is a side of the file which has no teeth on it, and is used for filing in a corner without cutting more than one of the work surfaces. A file is "taper" when it is thinner toward the point, "parallel" when it is of the same dimensions throughout, and "blunt" when it is between a taper and parallel.

Formerly all files were made by hand. The blank, which is a piece of annealed steel, is held on to a lead block by a strap which passes down and is held by the file cutter's foot in the loop or stirrup. The blanks are prepared by forging the tapered part for the handle and

then shaping the steel to the proper form under a press. The blanks then are annealed or softened, and cleaned from scale. The chisel used for rough files is about three inches long, two and a half inches wide, cutting edge straight and always wider than the file. The chisel is held in the left hand at an inclination of four to fifteen degrees from the perpendicular. The hammer is somewhat curved in the head with a short handle. In cutting, the file maker is guided by the sense of touch. The blow of the hammer drives the chisel forward, raising a burr. The height of this burr determines the next cut, for the chisel is moved against the ridge just raised, which affords a gauge for the position of the chisel at the next cut. The cuts are made at the rate of sixty to eighty a minute. The heavier the blow the greater the distance from the preceding cut at which the chisel is arrested. In making the second cut the blows are lighter, so as to cause the chisel to barely penetrate to the bottom of the first cuts. Consequently the second series of cuts are finer than the first. The punches which cut the teeth of rasps have a pyramidal point.

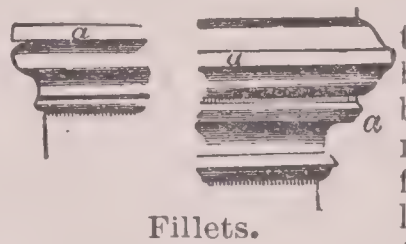
Here is one way of tempering files: They first are drawn through beer grounds, yeast, or other adhesive fluids, and then through common salt mixed with roasted and pounded cow's hoof. The object of this is to protect the teeth from the direct action of the fire, and the oxidizing influence of the air, also to afford an index to the temperature to which the file is subjected. The salt fuses when the hardening temperature is attained. The file is held by its tang in a pair of tongs, and when properly heated is plunged into water quickly, slowly, vertically, or obliquely, according to the form and shape of the file. After hardening, the tang is tempered by plunging it in melting lead. The files next are scoured with brushes, and then put into limewater and left there for some hours. They then are thoroughly dried at the fire, and rubbed over with olive oil containing a little turpentine. Most files used to-day are cut by machine. The blanks are fed into the machine, and the feed is so regulated that a new cutting surface is presented at regular intervals to the chisel. For years inventors tried to make a machine which would cut files to equal the hand-cut files, but the cuts were too regular, both as to distance and height. This put all the work on the part of the file presented first to the work. But the machines used in the U. S. not only give the file that irregularity of cut necessary, but raise burrs which cannot be told from hand-cut files.

Filefish, a name given to certain fishes from their skins being granulated like a file. *B. capriscus*, a common inhabitant of the Mediterranean, has the power of inflating the sides of the abdomen at pleasure, and grows to the size of two feet. *B. aculeatus*, is a native of the Indian and American seas.

Fil'ibusters, a name given to those adventurers, chiefly from the U. S., who endeavored to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, but is ultimately from the English *flyboat*, referring to the small fast sailing vessels used by the buccaneers in the seventeenth century. Among the most noted of the filibusters was William Walker, who made three expeditions to Nicaragua (1855, 1857, 1860).

Fllicaja (fi-li-kä'yå), VINCENZO DA (1642-1707), an Italian poet, b. at Florence of a noble family. Among his most successful poems are the *Canzone to John Sobieski*, on the occasion of the relief of Vienna from the Turks, and the celebrated sonnet on *Italy*, imitated by Byron in the fourth canto of *Childe Harold*, stanzas 42, 43.

Filigree', a kind of ornamental openwork in gold or silver, wrought delicately in the manner of little threads or grains, or of both intermixed. The art was practised by the Etruscans and the Greeks of the Byzantine Empire. In the seventeenth century it was carried to great perfection in Italy, and silver filigree work is still largely manufactured in the south of Europe. Some of the Eastern nations, especially the Chinese and Malays, show great skill in the manufacture of silver filigree.



Fillets.

Fillet, in architecture, a small space or band, like a narrow ribbon, used along with moldings; *a*, *a*, *a* (see fig.) are examples of fillets, both in classic and Gothic architecture.

Fillmore, MILLARD (1800–1874), thirteenth president of the U. S. He began his political career in 1828; was member of Congress in 1832, and in 1849 became vice-president of the U. S. By the death of General Taylor, Fillmore was raised to the office of president, which he held till 1853.

Filtra'tion, the process of freeing a liquid from solid matter suspended in it by causing it to pass through some pervious substance or substances which catch and retain the solid matter. The materials of which a filter is composed must have pores or interstices sufficiently coarse to allow the passage of the liquid, and yet sufficiently fine to prevent the passage of any solid particles. On a small scale unsized paper is generally used; but on a large scale various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal, cloth, felt, horsehair, skins, silicated carbon, sponge, wood, wool, cane, capillary threads, etc., are all employed. In domestic filters the simplest forms are those in which the water passes down by its own gravitation through the filtering medium to a reservoir below. Lateral and ascending filtration are not uncommon. The filters at waterworks are large tanks or beds, made of good clay and filled with layers of large stones, pebbles, and coarse gravel, fine gravel, coarse sand and fine sand — the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its

suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. Filtration can only remove substances mechanically suspended in the liquid. In order to remove dissolved substances distillation is necessary. See *Pasteur*.

Finch, a large family of small seed-eating birds, inhabiting all parts of the globe, and belonging to the order Insessores, section Conirostres. They are distinguished by having a sharply-pointed, conical, and in most cases a strongly-formed bill, suitable for crushing seeds and other hard objects. The species have been divided among several sub-families, as the hawfinches, the true finches, the buntings, the larks, the bullfinches, etc.

Fin'den, WILLIAM (1787–1852), line engraver, b. in London. He engraved many illustrations for the *Annuals* and other books. In conjunction with his younger brother Edward and assistants he produced several extensive series of engravings of great merit; the first and most successful of which was *Illustrations of the Life and Works of Lord Byron*. Besides his bookplates, Finden produced some celebrated large engravings, among which may be mentioned *The Village Festival* after Wilkie, *George IV*, full length seated on a sofa, after Sir Thomas Lawrence, etc.

Findlay, Hancock co., O., on Blanchard River, 43 mi. s. of Toledo. Railroads: Toledo & Ohio Central (western division); C. C. C. & I.; C. H. & D.; L. E. & W.; F. Ft. W. & W. Industries: Wire nail works, three flouring mills, three iron foundries, tube works, excelsior works, flint glass, window glass, brick and tile, hayrake, basket, and many other factories. Oil and gas in vicinity. Surrounding country agricultural and mineral. The town was first settled in 1815. Pop. 1900, 17,613.

Fine, a pecuniary penalty exacted either in punishment of, or in compensation for, an offense, whether committed against an indvidual, in contravention of the laws of the community, or against the community itself.

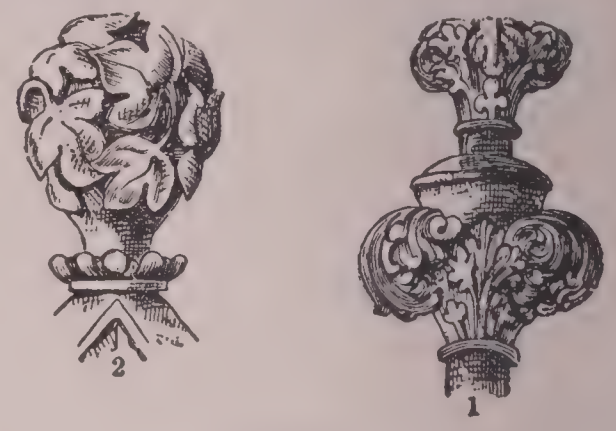
Fine Arts, the arts whose object is the production of pleasure by their immediate impression on the mind, as poetry, music, painting, and sculpture. In modern usage the term is often restricted to the imitative arts which appeal to us through the eye, namely painting, sculpture, engraving, architecture, and is sometimes even restricted to the two first as more essentially imitative and imaginative.

Fingal's Cave, a famous natural cavern in the island of Staffa, one of the western islands of Scotland. It extends 227 ft. from its mouth inward, is composed of lofty basaltic columns, beautifully jointed, and of most symmetrical, though somewhat varied forms. The height from the top of the arched roof to the mean level of the sea is 66 ft.; the breadth at the entrance 42 ft., at the end of the cave 22 ft.

Finger Board, the part of a stringed instrument, as the neck of a violin, guitar, etc., to which the fingers (of the left hand) are applied in playing to stop the strings. The finger board of a keyed instrument (played with both hands) is commonly called a *key board*.

Fingering, in music, (*a*) the art of dexterously applying the fingers to a musical instrument in playing. (*b*) The marking of the notes of a piece of music, as for the piano, organ, harmonium, concertina, etc., so as to guide the fingers in playing.

Fin'ial, in architecture, an ornamental bunch of foliage which terminates pinnacles, canopies, pediments, etc., or any ornament of like



Finials.

kind. By older writers the term is used to denote not only the leafy termination but the whole pyramid mass.

Finiguerra (fin-i-gwer'rå), TOMMASO (or Mason), a Florentine goldsmith of the fifteenth century, the inventor of the method of taking impressions from engraved plates.

Fi'ning, a substance used to clarify liquors, usually such as are out of condition or are of inferior quality. A solution of isinglass is generally used for beer, and alum, carbonate of soda, salt of tartar, etc., for spirits. Finings always destroy some of the real virtue of the liquor.

Finistère (fi-nis-tār) ("Land's End"), a department of France, so named from occupying its westernmost extremity; area 2,595 sq. mi. The soil is generally fertile and well cultivated; fishing is extensively carried on; and the minerals are of considerable importance, including iron, zinc, bismuth, and lead. The manufactures consist chiefly of sailcloth, linen, soap, oil, candles, ropes, leather, paper, and tobacco. Shipbuilding also is carried on, and the general trade is extensive. Quimper is the capital; other towns are Brest, Châteaulin, and Morlaix. Pop. 707,820.

Finnisterre, CAPE, the most western cape of Spain, on the coast of Galicia.

Fin'land, a Russian grand-duchy, containing 134,829 sq. mi.; bounded n. by Norway, e. by the governments of Olonetz and Archangel, s. by the Gulf of Finland, w. by Sweden and the Gulf of Bothnia. The capital is Helsingfors. The most valuable exports are the products of the forests, timber, pitch, tar, and resin. The forests occupy 60 per cent. of the surface. The climate is severe, but healthy; the mean yearly temperature in the north is 27.5° F., at Helsingfors 38.7°. The principal minerals are iron and copper; granite is extensively quarried. The inhabitants are mostly Finns and Swedes, with a few Lapps, Russians,

and Germans. Up to the twelfth century the Finns lived under their own chiefs and were pagans. Their conversion to Christianity took place about the middle of that century after their conquest by the Swedes. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by treaty. The remainder was conquered from the Swedes in 1809. The religion, laws, and liberties of the country have, however, been preserved, and Finland is perhaps the freest part of the Russian empire. The established religion is Lutheran; but there is complete religious freedom for other bodies. The national parliament consists of four estates, the nobles, the clergy, the burgesses, and the peasants, convoked by the grand duke, the emperor of Russia. The superior administrative power is in the hands of the senate, which is nominated by the crown, and sits at Helsingfors under the presidency of a governor general representing the emperor. The governor general is usually a Russian and is appointed by the emperor. All other officials, as well as the officers of the army, must be Finnish subjects. The army on the peace footing numbers about 5,000, with about 20,000 reserves. Finland has its own money and system of custom houses. Pop. 2,250,000.

Finland, GULF OF, a great arm of the Baltic, 250 or 260 mi. long and from 10 to 70 mi. wide, stretching from w. to e. between Finland on the n. and the Russian governments of Esthonia and St. Petersburg on the s. Its waters are only slightly salt. It contains numerous islands, several excellent harbors, and strong fortresses.

Fin'lay, GEORGE, historian (1799–1875), b. of Scotch parents at Faversham, Kent. He was educated, chiefly at Glasgow, for the legal profession, but, stirred by the cause of Greek independence, he went to Greece in 1823, and thenceforward lived chiefly at Athens devoted to the service of his adopted country. His chief work, *The History of Greece from its Conquest by the Romans to 1864*, was published in sections under different titles: *Greece under the Romans*, *History of the Byzantine Empire*, etc.

Fin'mark, a division of Norway, in the extreme north, partly bounded by the Arctic Ocean. The cod fishery employs a large number of boats and men, and a great quantity of cod-liver oil is made. Pop. 24,075.

Finney, CHARLES G. (1792–1875), American clergyman, b. at Warren, Conn. He became an evangelist and later was professor of theology at Oberlin College. He was also president of that institution 1851–1866. Among his works are, *Lectures to Professing Christians*, *Sermons on Important Subjects*, and *Sermons on Gospel Themes*.

Finns, in their own language called *Suomalainen*, are a race of people inhabiting the northwest of European Russia (governments of Archangel and Olonetz), but especially the grand-duchy of Finland. In a wider sense the term Finns, with its adjective Finnic, is applied to one of the chief branches of the northern or Uralo-Altaic division of the Turanian family of peoples and languages. The typical Finns are physically of low stature but of strong build; with round head, forehead low and arched, features flat with prominent cheekbones, and oblique eyes. Their language belongs to the northern division of the Turanian or Uralo-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It is agreeable to the ear, rich in vowels and diphthongs, copious, and uncommonly flexible. Finnish literature is valuable chiefly for its rich stores of national poetry. These poems, which have been preserved by oral tradition from the times of heathendom, were gradually dying out till 1835, when Lönnrot grouped together in one whole, all the fragments he could lay his hands on and published them, under the title of *Kalevala*, as the national epic of the Finnish people. A second edition, increased almost by one half, was published by him in 1849. He also published a collection of 592 ancient lyric poems and 50 old ballads, and collections of proverbs and riddles. A great impulse has been given to the cultivation of the language in modern times. It is now recognized as an official language side by side with Swedish, and is becoming more and more the vehicle for imparting instruction. In many of the higher educational institutions for both sexes in Finland the Finnish language is used. Works on science and history as well as poetry have been written in Finnish in recent years; a great Finnish-Swedish dictionary has been published, and there are now a considerable number of newspapers. The center of this literary life is Helsingfors.

Fins, the projecting wing-like organs which enable fishes to balance themselves and assist in regulating their movements in the water. The fin consists of a thin, elastic membrane supported by rays or little bony or cartilaginous ossicles. The *pectoral* or breast fins are never more than two; they are placed immediately in the rear of the gill, opening on the shoulder. In a state of rest these fins are parallel with the body, and have the apex toward the tail. The *ventrals*, or abdominal fins, are placed under the throat or belly, and point downward and backward. They are smaller, in general, than the pectorals, and have sometimes long appendages. Those of the back, or the *dorsal* fins, point upward and backward, and vary in number from one to four, to which sometimes are added several finlets—small appendages which are seen in the mackerel. The *anal* fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. The *caudal*, or tail fin, terminates the body, and both propels the fish and serves as a rudder by which it steers itself. The pectoral and ventral are known as *paired* fins, and represent the fore and hind limbs of other vertebrates.

Finsbury, a parliamentary borough of England, forming part of London, bounded by the parliamentary boroughs of St. Pancras, Isling-

ton, Shoreditch, London City, and Westminster. Since 1885 it returns three members to Parliament. Pop. 182,109.

Finster-Aarhorn (är′ horn), the highest peak of the Bernese Alps, 14,026 ft. above the level of the sea.

Fiord, a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly-shaped inlets of the sea, such as diversify the coast of Norway. Similar inlets of the sea are presented in the sea lochs of the west coast of Scotland, as also in the fiords on the south-west coast of the South Island of New Zealand, where the scenery is singularly imposing. Fiords often seem to owe their origin to the action of glaciers in remote epochs of the earth's history.

Fir, a name sometimes used as co-extensive with the term *pine*, and including the whole genus *Pinus;* sometimes restricted to trees of the genus *Abies*, which differ from the pines in their leaves growing singly, and the scales of the cones being smooth, round, and thin. The term fir, thus limited, is applied to the different varieties of the *silver fir* and the *spruce fir*, the common silver fir being the *Abies picea* of botanists, while the common or Norway

Norway Spruce Fir.

a.—branchlet with male flower; *b.*—branchlet with female flower; *c.*—mature cone; *d.*—one of the scales of cone, outside; *e.*—one of the scales of cone, inside, showing seeds; *f.*—a leaf with cross section; *g.*—gall, caused by punctures of *Cocus abietis* and other insects.

spruce is the *Abies excelsa*. The firs, even in the widest sense of the term, are almost all remarkable for the regularity of their growth, their tapering form, and the great altitude of their stems. Their timber is often highly valuable, being almost solely used in the construction of houses, and for the spars and masts of vessels of all kinds. Some of them are planted mainly as ornamental trees. By some botanists the larch and cedar are included with the firs in the genus *Abies*.

Firdu'si (or Firdau'si), Abul Kasim Mansur (931–1020), the greatest epic poet of the Persians, was b. at Khorassan. At the request of the Sultan Mahmud, or Ghuznee, Firdusi undertook to write an epic on the history of the Persian king, the king promising him a piece of gold for each verse. Firdusi devoted a large number of years to this work, and produced an historical poem of 60,000 verses, entitled *Shanameh* (*Book of the Kings*), containing the history of the Persian rulers from the beginning of the world to the downfall of the Sassanian dynasty (632 A. D.), and consisting properly of a succession of historical epics. The sultan, prejudiced against Firdusi by the poet's enemies, gave him only a piece of silver for each verse. In return Firdusi retaliated with one of the bitterest and severest satires ever penned. The *Shanameh* is one of the finest Asiatic poems. No work in the Persian language can be compared with it. It abounds in rich imagery, contains many passages of splendid poetry, and is of great interest to historians and ethnologists. A French translation of the *Shanameh* by Mchl, with the Persian text, was published by the French government.

Fire, the simultaneous and vividly perceptible evolution of heat and light during the process of combustion. The uses and dangers of fire, and to some extent the means of controlling it, have been generally understood from a very early period. The symbolic and superstitious uses of fire are numerous, and have been, or are, common to all races. Anciently fire was regarded as one of the four elements of which all things are composed, the other three being *air*, *earth*, and *water*.

Fire-alarm, an apparatus, mechanical, electric, and telegraphic, used for detecting fires, and for giving instantaneous notice of an outbreak. Detectors are often placed in the different apartments of a building, which ring an alarm when the temperature reaches a certain height. In large towns a series of signal boxes is distributed in different quarters from which an alarm can be immediately telegraphed to the fire brigade station.

Fire-ball, 1, A ball filled with powder or other combustibles, intended to be thrown among enemies, and to injure by explosion, or to set fire to their works. 2, A popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and unfrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors that explode in their passage, and appear to let fall a dull red body (meteorolite) to the earth.

Fire Clay, a compact kind of clay, consisting chiefly of silica and alumina, capable of sustaining intense heat, and used in making fire-bricks, gas-retorts, crucibles, etc. The most highly esteemed fire clay is that of Stourbridge, which is used whenever high temperatures have to be resisted. Fire clay belongs to the coal formation, and always forms a stratum immediately below each seam of coal.

Firecrackers. The Chinese or Hindus were the first makers of fire works, and probably gunpowder or something like it was burned on festival days several thousand years ago in China. Americans began to make firecrackers only a few years ago, although at the present time they are turned out by the millions and so far as noise is concerned, they are much superior to the Chinese cracker. One of the largest factories is in New Jersey. The smallest firecracker made is about 2½ in. ong and from that size they run up to over a oot in length. The tube of the cracker is made of strawboard; the fuse is spun cotton soaked in a mixture of starch and gunpowder, and the explosive is a mixture of powdered charcoal, bichromate of potash, and chlorate of potash. For tubes the pasteboard is cut into sheets of such a size that when a sheet which is 2½ in. wide is rolled up, it will make a neat tube half an inch in diameter and several thicknesses of pasteboard. The ten-inch firecrackers are about 2½ in. in diameter. In making the tube about 50 sheets of pasteboard are arranged on a slab of stone so that the 50 sheets have part of their ends exposed. Upon these exposed ends is laid a strong, quick-drying paste, and they are then ready to be rolled up. The tool which rolls them up is a steel roller, of the exact size of the inside of the firecracker, which runs back and forth on two steel tracks about half an inch high. The 50 sheets of pasteboard are placed between the tracks above the tube-making machine, and the roller is pressed against the sticky pasted end of the top sheet of pasteboard, and the roller is given a forward turn, and the pasteboard curls around the piece of polished steel forming a tube. One person can turn out about 2,500 tubes in a day. The tubes are next placed on a rack in a hot room and dried for two or three days when they are ready for filling. The bottom of the firecracker is plugged with a piece of cork or pith, or with a pasteboard wad. The top is plugged with clay or wood-pulp mixed with a strong adhesive, and through this clay, which is generally used, the fuse runs. The fuse is put in first. The firecrackers are set up in a board upon which are placed in upright position 100 brass, wooden, or iron pins. These pins are just the size and shape of the inside of the firecracker and about three fourths of an inch shorter so that when the tube is slipped down over one of the pins the tube will stick up above it about three fourths of an inch. Each pin has a round hole running through its center, and before the tube is placed on the pin the fuse for the firecracker is stuck in the hole leaving a couple of inches of it above the pin. A pinch of prepared clay is then rammed down in the tube upon the pin; next the explosive is put in and a piece of cork, or whatever is used, is rammed down to the powder of each firecracker. The firecrackers are then coated with red paper, dried, and packed.

Fire damp, light, carburetted hydrogen gas or marsh gas. It is sometimes very abundantly evolved in coal mines, and is productive

of the most dreadful results, occasioning the death of nearly all employed in the mines, from its explosion. It appears to be generated by the decomposition of partially carbonized coal, and when it constitutes more than $\frac{1}{13}$th of the volume of the atmosphere of mines the whole becomes highly explosive when fire is brought in contact with it. The safety lamp affords the chief protection against the fatal effects of this gas.

Fire Engine, an engine for throwing water to extinguish fire and save buildings. Hand fire engines are a species of force pumps, in which the water is subjected to pressure sufficient to raise it to the required height. The engine is usually furnished with a suction pipe which is attached to a water main, or the like, and is thus self-feeding. Steam fire engines now in common use have pumps either piston or rotary, and may be either single or double. The boilers are either flue, tubular, or coil. The heaviest engines now in use weigh, fully equipped, about five tons; but the preference is for an engine weighing three tons. The most powerful engine has a maximum capacity of 900 gallons per minute; the smallest 300 gallons. The invention of the automatic relief-valve is a most important improvement. By this device the pipeman has control of the flow of water. Horse power is generally used to draw steam fire engines, but steam has been successfully employed for the same purpose. Such an engine was first used in New York in 1873. The chemical fire engine is much used in our villages and smaller cities. The best form is the double tank. These tanks hold from 70 to 100 gallons. They contain a chemical mixture with water, producing carbonic acid gas, which generates the pressure necessary to force the mixture through the hose, with a $\frac{1}{4}$ to $\frac{1}{2}$ inch nozzle, about 150 ft. The hose cart is ordinarily built to carry about 900 ft. of hose; the four-wheeled cart drawn by two horses is preferred for large cities. The hose now used is the rubber or combination, made of rubber upon a body of cotton fabric, being both covered and lined with rubber; or the cotton rubber lined, made of cotton woven cylindrically and rubber lined.

Fire Escape, a contrivance for enabling persons to escape from the upper part of a building which is on fire. It is composed of an arrangement of long ladders, capable of being drawn out after the manner of a telescope, and mounted on wheels for easier transport from place to place. Under the whole length of the lower or main ladder is a kind of trough made of stout sailcloth, protected by an outer trough of copper wire net. This trough is used for lowering people from a burning house who are unable from fear or other causes to descend the ladder.

Firefly, a name indefinitely given to any winged insect which possesses much luminosity. True fireflies are found only in the warmer regions of the earth. The *elater* of South America and the West Indies is one of the most brilliant, giving out its light from two eyelike tubercles on the thorax. Their

light is so powerful that small print may be read by it, and in Hayti they are used to give light for domestic purposes, 8 or 10 confined in a phial emitting sufficient light to enable a person to write.

Common Firefly, in burrow of mole cricket, showing the two, oval phosphorescent organs on the throax.

Fire of London, THE GREAT, broke out in a house near London Bridge, Sept. 2, 1666, and raged for several days. Two thirds of London was destroyed—89 churches and more than 13,000 dwelling houses. The monument erected by Wren at Fish Street Hill commemorates the great fire, and at one time bore an inscription attributing the fire to the popish faction.

Fireproofing.—Various plans have been adopted for rendering houses, or an apartment in a house, fireproof, as by constructing them entirely of brick or stone, and employing iron doors, ties, and lintels, stone staircases, and landings. In the case of textile fabrics, as cotton, linen, etc., saturation with various salts, as borax, which leave their crystals in the substance of the fabrics is the means adopted for rendering them incombustible. Wood is best protected by silicate of soda, which, on the application of strong heat, fuses into a glass, and this, enveloping not only the outside but also the internal fibers of the wood, shields it from contact with the oxygen of the air. Fireproof safes are generally constructed with double walls of stout iron, having a space between the walls filled with some substance which is a very bad conductor of heat.

Fire Ships are generally old vessels filled with combustibles, and fitted with grappling-irons, to hook enemies' ships and set them on fire. This ancient device has been frequently tried in modern warfare, though it can never be of much effect when employed against modern ships.

Fireworks, preparations in various shapes of gunpowder, charcoal, sulphur, saltpetre, filings of iron, etc., used for display at times of public rejoicing, etc. They may be divided into simple hand pieces, such as squibs, crackers, rockets, Roman candles, etc., and arranged "pieces," which are contrived with much skill and ingenuity to represent, when ignited, various devices and pictures.

Fire Worship, the worship of fire, the highest type of which worship is seen in the adoration of the sun, not only as the most glorious visible object in the universe, but also as the source of light and heat. In the early religion of India the sun appears in the form of the god Agni, what was first regarded as a mere abstract influence or a phenomenon, in time being regarded as a sentient individual. Thus in the Vedic hymns Agni is the god of fire, corresponding to Vulcan. In the East the worship of the element of fire was practised by the ancient Persians, or Magians, and is continued by the modern Parsees. The establishment of this species of idolatry among the Persians is ascribed to Zoroaster, who taught his disciples that in the sun and in the sacred fires of their temples God more especially dwelt, and that therefore divine homage was to be paid to these.

Firm, a partnership or association of two or more persons for carrying on a business; a commercial house; or the name or title under which a company transacts business. *Long Firm*, a term given to that class of swindlers who obtain goods by pretending to be in business in a certain place, and ordering goods to be sent to them, generally from persons at a distance, without any intention of payment. When they have obtained all they can in this way they decamp, to reappear elsewhere under a different name. A person practising this system is said to be a member of the Long Firm.

Fir'man, a decree, order, or grant of an Oriental sovereign, as of Turkey, issued for various special purposes, for instance, to insure a traveler protection and assistance. It differs from a *Hatti Sherif* in so far as it may be signed by any minister, whereas the Hatti Sherif is approved by the Sultan himself with his special mark, and is therefore supposed to be irrevocable.

Fish Commission, THE U. S., established in 1871, for fostering the fishing industries by distributing food fishes. State Fish Commissions are in existence throughout the country.

Fisheries, a term which includes all the industries concerned in the capture of the inhabitants of fresh and salt water for food and other economic purposes. It is thus applied to the procuring not only of fish proper, but also of other animals and products found in the sea, such as sponges, corals, pearls, shellfish, turtles, whales, seals, etc. The most important of fresh water fisheries is that of salmon, which is prosecuted with draw nets, stake nets, and by sportsmen with fly hooks. Trout, eel, pike, and perch are among the other important fresh water fishes. Sea fisheries, including the herring, cod, haddock, and other fishes, are prosecuted in a variety of ways. Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode of capture, etc., which vary with the particular circumstances. The countries whose fishing industries produce the most valuable returns are the U. S., Great Britain, and British N. A. The banks of Newfoundland are one of the

1. Pheronema Sponges. 2 Glass-rope Sponges. 3. Sponges named by Schultze. 4. Sponge resembling a Cl
9. Drymonema Victoria. 10. Ypsilothuria attenuatta. 11. Club-shaped Sponge 12 Oueirophanta mu
17. Hymenaster rex. 18 Arcformed Crustacia. 19. Sea-insect with long Threads. 20. Colossendeis Titan
and long tail. 25. Fish, scaly-head and long tail. 26. Neostoma bathyphilum. 27. Long-tailed, globe-sha

26

7

1

21

12 18 14

nblike Sponge. 6. Sponge with Cartilaginous Branches 7 Actinotheca pellucida 8. Comb-like Starfish.
. Enphronides Talismani 14 Peniagone rosea 15 Psychropotes buglossa 16 Styracaster spinosus.
; Sea-spider 22. Sack shaped, long-tailed Animal 23 Large-mouthed Fish 24 Sea-fish with large mouth
28. Club-shaped Fish. 29. Large-mouthed, sharp-toothed Fish

richest fishing grounds in the world, and are largely frequented by French fishermen. The German Ocean also yields a very rich harvest to the fishermen of all the surrounding coasts, especially in herring, cod, haddock, flatfish, etc.

Fish, HAMILTON (1808–1893), statesman, was b. in New York City. In 1851 was elected U. S. senator. In 1868 was appointed secretary of state, serving during General Grant's two terms. His diplomatic services have been important and of great benefit to his country.

Fishes, DEEP-SEA, were not known with any definiteness till the *Challenger* expedition virtually discovered the new zoological world which they inhabit. The explorations of the *Talisman* and the *Travailleur* have also contributed important results to our knowledge of these usually strange-looking forms. To understand their peculiarities it is necessary to recall the principal factors in their environment. 1, Sunlight is absent, and so often are eyes, which, in the absence of stimulus, remain undeveloped. 2, The temperature of the bottom is low and equable, and a wide range of distribution is thus unimpeded. 3, The pressure is, of course, enormous at those great depths, and, though the fishes feel it as little as we do that of the air, it has doubtless been an important factor in determining their structure. 4, As sunlight is absent, so also are plants. The abyssal fish are therefore carnivorous, "the most voracious feeding frequently on their own offspring, and the toothless kinds being nourished by the animalcules which live on the bottom, or which, 'like a constant rain,' settle down from the upper strata." Some of the carnivorous forms show evidence of great rapacity, and not a few are characterized by wide gape and dilatable stomach, able to "receive a fish twice or thrice the bulk of the destroyer." 5, Lastly, the perfect calm of the abyssal water must be remembered, and associated with the tendency many of the fishes have to develop long, delicate filaments on fins or tail.

Fishhooks. The best fishhooks are made by hand, and the following is an outline of the stages in the process. 1, Soft cast-steel wire is cut into lengths required for a given size of hook. 2, A number of these cut wires are placed on a plain surface against an upright, and the beards or barbs are formed. 3, The points are put on by filing the wires. 4, By means of a mold mounted in a wooden handle the wires are bent or turned to a proper shape. 5, The ends of the shanks are now ringed, flatted, or marked by an ingenious machine or hammer. 6, At this stage the hooks are placed in a furnace and brought to a certain heat, which varies with the kind of hook, and then plunged into a vat of oil. 7, They are next tempered by placing them, mixed with emery sand, in a pot over a charcoal fire. There they are kept in constant motion till they are sufficiently tempered. 8, Scouring is effected by placing the hooks with water in barrels and keeping these in motion for one or two days, to remove all scale. 9,

Polishing is done by placing the hooks in an oblong bag with emery and rapidly shaking them. Fishhooks are now, however, chiefly made by machinery which performs most of the above operations automatically.

Fish Joint, a splice or joining, as in railways, where two rails end to end are fastened together by flat pieces of iron (*fish plates*) placed on each side of the rails, and fastened by screw-nuts and bolts (*fish bolts*).

Fiske, JOHN, American author, b. at Hartford, Conn., 1842. An overseer of Hartford University. Author of many publications, including *Darwinism and other Essays*, *The Idea of God, etc.*, *Myths and Myth-makers*, *The Destiny of Man*, *A History of the U. S.*, *The Critical Period of American History*, *The War of Independence, etc.*

Fisk University, an institution for the higher education of colored people, situated at Nashville, Tenn. The university was founded by the American Missionary Society and Western Freedmen's Aid Association in 1865. It has five buildings, a gymnasium and athletic ground. It has an income of $43,000, 465 students, 30 instructors, and 5,227 books.

Fissirostres (-rostrēz), a tribe of the Insessores or perching birds, distinguished by having a very wide gape, extending beneath the eyes. It comprehends the night jars or goatsuckers, whip-poor-will, swallows, swifts, martins, etc., but in modern classification this division is often disregarded.

Fissurel′lidæ, the keyhole limpets, a family of molluscs resembling the limpets in appearance and habits, but differing considerably in structure. The animal is generally too large for the shell, so that, in the typical genus *Fissurella*, the shell appears as if it were rudimentary. The species are widely distributed.

Fitch, JOHN (1743–1798), inventor, was b. in East Windsor, Conn. In 1785 he completed his first model of a steamboat. His second boat made a successful trial trip in 1787, on the Delaware. In the summer of 1790 a boat built by him made regular passenger trips between Philadelphia and Burlington, with a speed of 8 mi. an hour. In 1791 he received a U. S. patent. In 1817 a committee of the New York legislature decided that he was inventor of the steamboat.

Fitchburg, an American city, Worcester co., Mass., 40 mi. n.w. of Boston; has manufactures of paper, machinery, woolen goods, etc. Pop. 1900, 31,531.

Fitchet (or Fitch), the fur of the polecat. It has a yellow ground, with long, soft, black shining hairs on its surface, which are exclusively used for artists' brushes. The fur is not in great request, as it emits an unpleasant odor which is difficult to dissipate.

Fitzroy′, ROBERT (1805–1865), English admiral and meteorologist. He entered the navy in 1819, and from 1828 to 1836 was employed in hydrographical surveys, and in forming a chain of meridianal distances around the globe. He acquired great popularity with the public for the system of storm warnings which he established.

Fiume (fi-ö′me), a seaport town of Austro-Hungary, and a free town of the Hungarian kingdom, picturesquely situated on the Gulf of Quarnero in the n.e. extremity of the Adriatic. Large sums have recently been spent by the Hungarian government on the improvement of its harbor accommodation, and it is now a place of large trade. Pop. 20,981.

Five Forks, a locality in Dinwiddie co., Va.; the scene of an important battle fought April 1, 1865, one week before the close of the Civil War. After heavy fighting the Confederates were completely defeated.

Fives, a kind of game with a ball, originally called hand tennis, played on a level piece of ground with a smooth wall, against which the ball is struck after its first rebound from the ground; so named probably from its being usually played with five on each side, although others give different explanations, as that it is so called because the ball is struck with the hand or *five* fingers. See *Hand Ball.*

Fixed Alkalies, potash, soda, lithia, and oxides of the rare metals rubidium and cæsium, so named in contradistinction to ammonia, which is termed volatile alkali.

Fixed Stars, those stars which appear to remain always at the same distance from each other, and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets.

Fixtures, in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property and pass to the freeholder, not being removable at will by the tenant or occupier of the property. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent.

Flag, a piece of cloth on which certain figures or devices are painted, impressed, or wrought, borne on a staff or pole, and usually employed to distinguish one company, party, or nationality from another. In the army, a flag is a banner by which one regiment is distinguished from another. Flags borne on the masts of vessels not only designate the country to which they belong, but also are made to denote the quality of the officer by whom a ship is commanded. In the U. S. navy distinctive blue flags with four, three, and two white stars, are worn at the main, fore, and mizzen, by admirals, vice admirals, and rear admirals respectively. Commodores have a broad, blue pennant, with one white star which is worn at the main when the commodore is acting as commander-in-chief. Any officer commanding a vessel, except one on board of which a flag or broad pennant may be worn, shall wear a narrow pennant at the main. When powder is taken on board a red flag is hoisted at the fore. A yellow flag is the quarantine flag. Flags of truce are white, and on water are met by a boat or vessel from the senior officer's vessel, in charge of a commissioned officer, having a white flag. To lower or *strike* the flag is to pull it down, or take it in, out of respect or submission to superiors. To lower or strike a flag in an engagement is a sign of yielding. A sign of mourning is to hoist the flags at a half or two thirds of the height of the masts; if on land, half the height of the staff. Besides the use of flags as distinguishing emblems, a very important use of them at sea, both by national and merchantile navies, is as signals according to an arranged code.

Flag, AMERICAN.—The birthday of the American flag was on June 14, 1777, when the Congress "*Resolved*, That the flag of the Thirteen United States shall be thirteen stripes, alternate white and red, and that the union be thirteen white stars on a blue field." At this time there was no suggestion as to how the stars should be arranged or how many points each should have. Paul Jones displayed an ensign on the *Serapis* (1779) at Texel, in which the stars had eight points, and the stripes were blue, red, and white. The first flag is said to have been made by Mrs. Elizabeth Ross, flagmaker at 239 Arch St., Philadelphia. The French navy first saluted the American flag, Feb. 14, 1778. The first recorded naval engagement under the flag was between the *Ranger* and the *Drake* (English), April 24, 1778. At Ft. Stanwix (now Rome), N. Y., upon the enemy appearing unannounced on Aug. 3, 1778, a mosaic flag was hastily constructed out of strips of sheets and bits of scarlet cloth sewed together, while out of Capt. Abraham Swartout's camlet cloak was constructed the field for the stars. The stars and stripes were associated with all the glory of the last days of the Revolution, and hung in prophetic splendor over Yorktown. The first time colors were unfurled over a foreign country was when Capt. John Rathburne took possession of Ft. Nassau, New Providence Islands. The American colors were first shown in a British port by the ship *Bedford*, of Nantucket, reporting at the custom-house, London, Feb. 6, 1783. The national emblem during the War of 1812–14 had fifteen stars and fifteen stripes, the number having been increased by an act of Congress on the admission of Vermont and Kentucky, 1795. Eben Appleton, Yonkers, N. Y., grandson of Colonel Amstead, has in his possession the flag whose "broad stripes and bright stars" inspired the *Star Spangled Banner*, written by Francis Scott Keys. On the admission of Indiana, 1816, a committee was appointed to inquire what changes were necessary to be made in our national emblem. At the suggestion of Capt. S. C. Reid the number of stripes was reduced to the original thirteen, and the stars increased to represent the number of states. By the following enactment, April 4, 1818, the present status of our flag was fixed: "*Resolved*, That from and after the 4th of July next, the flag of the United States be thirteen *horizontal stripes*, alternate red and white; that the union have twenty stars, white in a blue field." "That on the admission of every new state one star be added to the union of the flag, and that such additions shall take

effect on the 4th of July next succeeding such admission."

The *revenue* flag of the U. S. differs somewhat from the national emblem. Outside American waters revenue vessels may bear the national ensign in addition to the revenue flag. The president's flag is blue, bearing the coat of arms of the U. S., and is worn at the main of the naval vessels and boats in which he embarks. The revenue flag was created by an act of Congress, March 2, 1799; it consists of 16 perpendicular stripes. The union bears the arms of the U. S. in dark blue on a white field, and in 1871, thirteen blue stars were substituted. Flag *half-mast* is a sign of national mourning, and the union turned down is a signal of distress. *Dipping* the flag is hauling it down a few feet and then running it up again. Salutes are made by dipping. In the U. S. navy when the flag is hoisted at "colors," or hauled down at sunset, the officers and men are required to salute. "The stars and bars" of the Confederacy was adopted in 1861. One or two changes were made in this flag, and at the close of the war the stripes ran perpendicularly instead of horizontally. The stripes were three, red and white, and the stars nine.

Flagellants (flaj'el-ants), the name of a sect in the thirteenth century who maintained that flagellation was of equal virtue with baptism and other sacraments. They walked in procession with shoulders bare, and whipped themselves till the blood ran down their bodies, to obtain the mercy of God, and appease his wrath against the vices of the age. Rainer, a hermit of Perugia, is said to have been its founder in 1260. He soon found followers in nearly all parts of Italy. Their number soon amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms; and for centuries they formed a sort of intermittent order of fanatics, frequently reappearing here and there in times of extraordinary declension or distress.

Flageolet (flaj'o-let), a small, wind instrument of music, played by means of a mouthpiece. The tone produced is similar to that of the piccolo, but is softer in quality, and the range is two octaves. The double flageolet consists of two instruments united by one mouthpiece and producing double notes. The name *flageolet-tones* is given to those harmonic tones on the violin, violoncello, and other stringed instruments, produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the finger board.

Flag Officer, in regular navy, a general distinguishing title for an admiral, vice admiral, and rear admiral, who have the right to carry flags indicating their rank at the mast head.

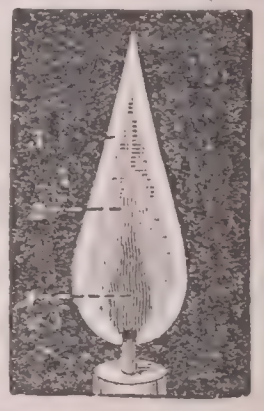
Flag of the Prophet, or sacred flag of the Mohammedans. It was originally composed of the turban of the Koreish captured by Mohammed; but the black curtain that hung in front of the door of Ayesha, one of Mohammed's wives, was afterward substituted. It is preserved in the seraglio at Constantinople.

The carefully guarded banner unfolded at the commencement of a war is not the real sacred flag, though it is commonly believed to be so.

Flahaut de la Billarderi (flå-ō de lå bē-yärdrē), Auguste Charles Joseph, Comte de, (1785–1870), French general and diplomatist. He had a brilliant career under Napoleon I., but on the return of the Bourbons he left France and lived in exile from 1815 to 1830. He married in England the daughter of Admiral Keith, who became Baroness Keith in 1823. He returned to France in 1830, and was ambassador successively at Berlin, Vienna, and London.

Flamboy'ant, a style of Gothic architecture in use in France about the same period with the Perpendicular style in England, that is, from the fourteenth to the sixteenth century. It was distinguished by the waving and somewhat flame-like tracery of the windows, panels, etc., and is usually regarded as a decadent variety of the decorated Gothic. The moldings in this style are often ill-combined. The pillars are often cylindrical, either plain or with a few of the more prominent moldings of the arches continued down them, without any capital or impost intervening. The arches are usually two-centered, sometimes semicircular, and, in later examples, elliptical.

Flame, a blaze rising from a burning body, or any inflammable gas in a state of visible combustion. Flame is attended with great heat, and sometimes with the evolution of much light; but the temperature may be intense with the flame of burning hydrogen gas. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion. When the pressure of the gas producing the flame is so great that it is all but flaring, it is found that certain sounds will cause the flame to alter its shape, thus producing *sensitive flames.*



Flame of a candle. Showing 1, area of noncombustion; 2, area of partial combustion; 3, area of complete combustion.

Fla'men, among the ancient Romans the name given to any priest devoted to the service of one particular deity. Originally there were three priests so called; *Flamen Dialis,* consecrated to Jupiter; *Flamen Martialis,* sacred to Mars; and *Flamen Quirinalis,* who superintended the rites of Quirinus, or Romulus; but the number was ultimately increased to fifteen, the original three, however, retaining priority in point of rank, being styled *Majores,* and elected from among the patricians, while the other twelve, called *Minores,* were elected from the plebeians.

Flamin'go, a bird generally ranked among the swimmers. Its body is smaller than that of the stork, but owing to the great length of the neck and legs it stands from 5 to 6 ft. high. The beak is naked, and bent as if broken; the feet are palmated and four-toed. The com-

mon flamingo occurs abundantly in various parts of Southern Europe, Northern Africa, etc. It is entirely scarlet, except the quill-feathers, which are jet black. The tongue is fleshy, and one of the extravagances of the Romans during the later period of the empire was to have dishes composed solely of flamingoes' tongues. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt marshes. They are extremely shy and watchful. While feeding they keep together, drawn up artificially in lines, which at a distance resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the

Flamingo.

rest. Their food appears to be mollusca, spawn, crustaceans, etc., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the crook in their beak. They breed in companies in inundated marshes, raising the nest to a certain height by heaping up the mud with their feet into a small hillock, which is concave at the top. In this the female lays her eggs, and it was formerly believed that she sat on them with her legs hanging down, like those of a man on horseback. But the nests are not so high as to allow of this, and the birds really sit with their legs doubled up under them.

Flaminian Way, the principal northern road which led from ancient Rome. It was constructed by C. Flaminius the elder in 220 B. C. during his censorship, and led from Rome to Ariminum on the Adriatic, 222 mi. Remains of it are yet extant in various places.

Flamini'nus, TITUS QUINTIUS (230–174 B. C.), Roman general. He was quæstor in 199, consul in 198, terminated the Macedonian War by the defeat of Philip at Cynoscephalæ 197, and proclaimed, at the Isthmian games in 196, the independence of Greece.

Flamin'ius, CAIUS, Roman general, was tribune in 232 B. C., prætor in 227, consul in

223, censor in 220, and again consul in 217. He had a triumph for defeating the Insubrian Gauls; and during his second consulship he constructed the Flaminian Way, and built a circus. In 217 he was sent against Hannibal into Etruria, and was defeated and killed in the battle of Lake Thrasymenus (June 23).

Flamsteed, JOHN (1646–1719), the first astronomer-royal of England. He was appointed by Charles II astronomical observer to the king, and carried on his observations at the queen's house at Greenwich until the observatory was built for him in 1676. Here he passed his life; formed the first trustworthy catalogue of fixed stars; and supplied the lunar observations by means of which Newton verified his lunar theory. His great work, *Historia Cœlestis,* was finished in 1723.

Flanders, a region of Europe now included in Holland, Belgium, and France, stretching along the German Ocean. The erection of the territory into a county took place in the ninth century, and was made by Philip the Bold, king of France, in favor of his son-in-law, Baldwin. It afterward passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and by the conquests of the Dutch in the north. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium. The Belgian province of EAST FLANDERS has an area of 1,157 sq. mi. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skillfully cultivated that it has the appearance of a vast garden. The principal crops are wheat and flax. Linen, laces, and damask are among the important manufactures. Gend, or Ghent, is the capital. Pop. 939,748. WEST FLANDERS has an area of 1,248 sq. mi. The most important branch of industry is linen. Great quantities of lace are also made. Bruges is the capital. Pop. 732,317.

Flannel, a woolen fabric of loose texture and various degrees of fineness, much used as a clothing both in hot and cold countries from its properties of promoting insensible perspiration which is absorbed and carried off by the atmosphere. Welsh flannels have attained a high reputation. In flannel shirtings the wool is frequently mixed with silk, linen, and cotton.

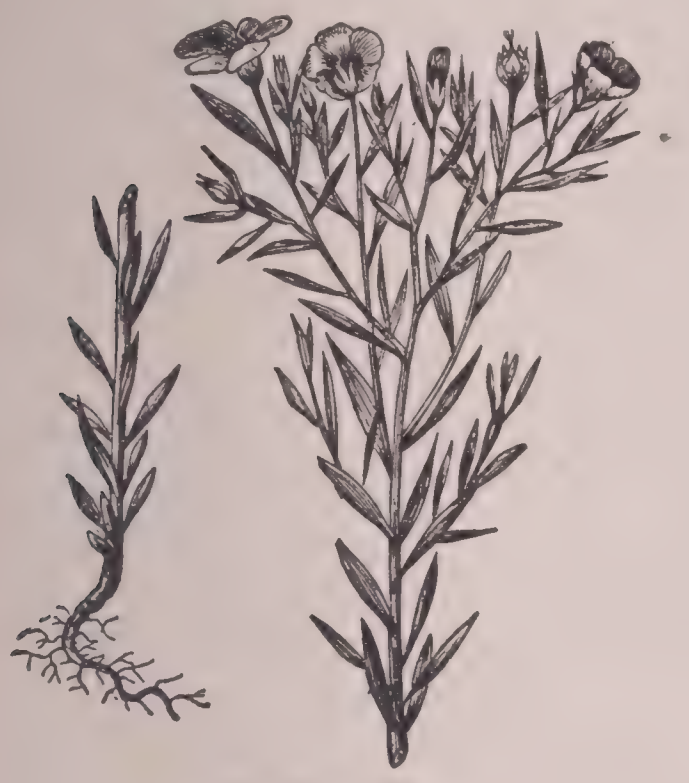
Flatfish, a fish which has its body of a flattened form, swims on the side, and has both eyes on one side, as the flounder, turbot, halibut, and sole. The sense is sometimes extended to other fishes which have the body much compressed, as the skate and other members of the ray family.

Flathead Indians, tribes established on the Pacific Coast, mainly of the now nearly extinct Chinook group of fish-eating Indians. They flatten the skull of the infant by pressure. The same custom anciently prevailed among many tribes, but the practise is now nearly extinct. The name Flathead is improperly given to the small, civilized tribe of

Selish Indians who do not flatten the heads of their children.

Flavine, a yellow dye-stuff identical with quercitron, and used as a substitute for quercitron bark. It gives a fine, olive-yellow color to cloth.

Flax, the common name of the plants of the genus *Linum*, nat. order Linnaceæ. The species, of which there are nearly a hundred, are herbs or small shrubs, with narrow leaves, and yellow, blue, or even white flowers arranged in variously formed cymes. They occur in warm and temperate regions over the world. The fiber, which is used for making thread, and

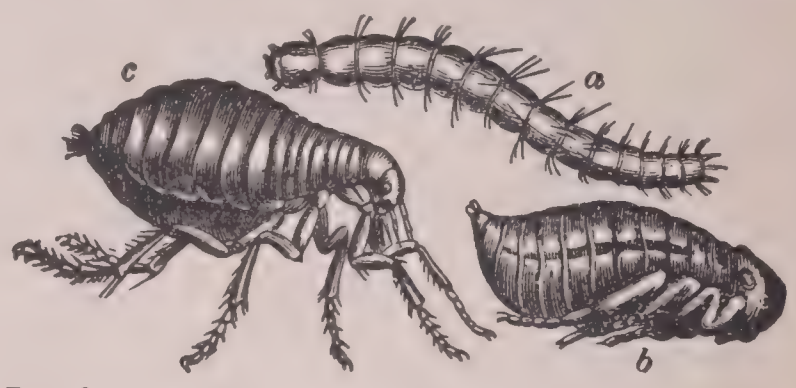


Common Flax.

cloth called linen, cambric, lawn, lace, etc., consists of the woody bundles of the slender stalks. The fine fibers may be so separated as to be spun into threads as fine as silk. A most useful oil is expressed from the seeds, and the residue, called linseed cake, is one of the most fattening kinds of food for cattle. When the plant is ripe it is pulled up by the roots, tied together in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth or by passing the stems through an iron comb. The process of removing the seeds is called *rippling*. The stalks are then *retted* or rotted in water to free the flaxen fiber from the woody core or *boon* of the stem. Two operations are necessary to separate the fibers from the woody part of the stem. The flax is first *broken* by means of a wooden handle and grooved board, or by revolving grooved rollers, and then the *boon* or woody part is entirely separated from the fiber by a broad, flat wooden blade called a *scrutching blade*, or by a machine in which a number of knives attached to the arms of a vertical wheel strike the flax in the direction of its length, and completely separate it. The flax is next *heckled*, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning.

Flaxman, John (1755–1826), one of the most distinguished English sculptors. In 1770 he was admitted a student of the Royal Academy, and for some years earned a living by producing designs for Wedgwood the potter. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius, besides executing designs in outline to illustrate Homer, Dante, and Æschylus. In 1794 he returned to England. He had been elected an associate of the Royal Academy in 1797, royal academician 1800, and in 1810 was appointed professor of sculpture to that institution.

Flea, a name for several insects regarded by entomologists as constituting a distinct order. All the species of the genus are very similar to the common flea. It has two eyes and six feet; the feelers are like threads; the oral appendages



Development of Common Flea magnified. *a.*—larva; *b.*—pupa; *c.*—perfect insect.

are modified into piercing stilets and a suctorial proboscis. The flea is remarkable for its agility, leaping to a surprising distance, and its bite is very troublesome.

Fleabane, a name popularly given to several composite plants from their supposed power of destroying or driving away fleas. The common fleabane whose smoke was supposed to expel fleas is found in moist, sandy places in the south of England. The blue fleabane is common on dry banks.

Flea-beetle, the name given to different species of beetles which are destructive to plants. The turnip flea, whose larvæ are sometimes so destructive to the turnip crops, furnishes an example.

Fleet Prison, once a celebrated prison in London till it was pulled down in 1845. It stood on the east side of Farringdon Street, and on this site a prison was in existence as early as the twelfth century, which took its name from the creek or stream of the Fleet, on the bank of which it was erected. It was early used as a place of confinement for debtors, and served as such down to the period of its abolition. It was called by Pope the "Haunt of the Muses."

Fleming, John, D. D. (1785–1857), Scottish naturalist, b. near Linlithgow. He wrote a *Report on the Economical Mineralogy of the Orkney and Zetland Islands; The Philosophy of Zoology; British Animals;* and a large number of papers on zoology, palæontology, and geology contributed to the *Encyclopædia Britannica*, *the Edinburgh Encyclopædia*, *the North British Review*, etc.

Flemish Language and Literature.—The

Flemish language is a form of Low German, differing only slightly in pronunciation and orthography from the Dutch. It is spoken by a considerable number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg, and Brabant. The "father of Flemish poetry," Jakob Van Maerlaut, wrote several romances dealing with Merlin and the Holy Grail, *The Mirror of History*, etc., in the thirteenth century; and a version of *Reynard the Fox* belongs to the same period. The translation of the Bible, which is considered the standard for the construction and orthography of the language, was finished in 1618. The French almost annihilated the native literature, and it did not revive till the revolution of 1830, since which time it has been very vigorous. The leaders in this revival were Willems, Blommaert, Van Ryswyck, Conscience, Van Duyse, Snellaert, Snieders, De Lact, De Decker, David, and Bermans.

Flensburg (formerly Flensborg), a town in Prussia, province of Schleswig-Holstein, at the west end of the fiord of same name, 20 mi. n.n.e. of the town of Schleswig. It is now the most important town in Schleswig. Pop. 33,094.

Fleur-de-lis (fl*eu*r-de-lē') (Fr., "flower of the lily"), in heraldry, a bearing, as to the origin of which there is much dispute; some authorities maintaining that it represents the lily, others that it represents the head of a lance or some such warlike weapon. The fleur-de-lis has long been the distinctive bearing of France.

Fleury (fleu-rē), Andre Hercule de (1653–1743); cardinal and prime minister of Louis XV. In 1698 Louis XIV gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal.

Fleury, Claude (1640–1723), French writer. He was educated in the Jesuit College at Clermont, and after beginning to practise as a lawyer resolved to take orders. He procured admission into the academy in 1696 by several important works, among which the best known are his *Histoire du Droit Français*, *Mœurs des Israélites*, *Mœurs des Chrétiens*, *Institution au Droit Ecclésiastique*, *Histoire Ecclésiastique*.

Flint (or Flintshire), a maritime county in North Wales, consisting of two separate portions, a larger and smaller, the latter being distant 6 mi. s.e. from the main portion, and separated from it by Denbighshire; total area 169,162 acres, of which three fourths is under crops or in pasture. The county is rich in minerals, particularly lead, the mines of which are productive. Coal also abounds, and copper is obtained in considerable quantities. Flint returns one member to the House of Commons. Pop. 77,189.

Flint, Genesee co., Mich., on the Flint River. Railroads: Chicago & Grand Trunk, and Flint & Pere Marquette. Flint is the location of the state institution for the deaf and dumb, and of Oak Grove Home, a private institution for the feeble-minded. Principal industries: charcoal manufactory, woolen mills, cigar factory, and wagon works. Large quantities of lumber are exported. Population 1900, 13,103.

Flint, a variety of quartz of a yellowish or bluish-gray or grayish-black color. It is amorphous, and usually occurs in nodules or rounded lumps. Its surface is generally uneven, and covered with a whitish rind or crust, the result of weathering or of the action of water percolating through the rocks. It is very hard, strikes fire with steel, and is an ingredient in glass and in all fine pottery ware. Its true native place is the upper bed of the chalk formation, in which it is formed as a series of concretions.

Flint Glass, a species of glass, so called because pulverized flints were originally employed in its manufacture. It is extensively used for domestic purposes. Its dispersive power in regard to light renders it invaluable in the manufacture of the object glasses of telescopes and microscopes, as by combining a concave lens of flint glass with one or two convex lenses of crown glass, which possesses a much less dispersive power, a compound lens is formed in which the prismatic colors arising from simple refraction are destroyed, and the lens rendered achromatic. Quartz and fine sand are now substituted for flint in the manufacture of this glass.

Floating Island, an island formed in a lake or other inland water, consisting generally of a mass of earth held together by interlacing roots. Sometimes such islands are large enough to serve as pasture grounds. Artificial floating islands have been formed by placing lake mud on rafts of wickerwork covered with reeds.

Floating Quartz (or Floatstone), a porous variety of quartz of a spongy texture, whitish gray in color, so light as to float in water. It frequently contains a nucleus of common flint.

Flock, the refuse of cotton and wool, or the shearing of woolen goods, etc., used for stuffing mattresses, furniture, etc. *Flock paper* is a kind of wall paper, having raised figures resembling cloth, made of flock, or of cloth cut up very fine, and attached to the paper by size or varnish.

Flora, the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. Her festival, the Floralia, was celebrated from April 28 to May 1 with much licentiousness. In botany, *flora* signifies the plants of a region collectively, as *fauna* signifies the animals.

Florence, a celebrated city of Italy, capital of a province of same name, 143 mi. n.w. from Rome, and 50 mi. e.n.e. from Leghorn. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures. The city contains numerous piazzas or squares, the most important of which is the Piazza della Signo-

ria. The most remarkable building in Florence is the Duomo, or cathedral of St. Maria del Fiore. The church of S. Croce is the burial place of many of the most eminent Tuscans, contains much fine sculpture and many interesting tombs, among others those of Michael Angelo Buonarotti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated 1865. The charitable institutions are numerous and important. Schools and other literary and educational establishments are also numerous. The manufactures have greatly fallen off, but still embrace woolens, silk, straw hats, porcelain, mosaics, and numerous objects in the fine arts. Florence was probably founded by the Romans in the first century B. C., and early attained considerable prosperity. In 1283 a species of republic was constituted; but about the year 1300 party struggles burst forth between rival families under the new names of the *Whites* and the *Blacks*, in which the Blacks were eventually victorious, and the Whites, among whom was the poet Dante, banished. On the fall of the republic in the sixteenth century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was placed by Charles V as duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterward emperor of Germany. From this period the history of Florence merges into that of Tuscany until its amalgamation with the kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin. Among the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, Machiavelli, and others. Pop. 191,453.

Florence, Louderdale co., Ala., on Tennessee River. Railroads: M. & C. R. R., N. F. & S., and Northern Alabama. Industries: cotton mills, wagon factory, stone foundry, pump and lumber co., spoke and hub factory. Coal in small quantities. Surrounding country agricultural. Florence was the home of Indian Chief Colbert. One of the largest Indian mounds extant is situated in Florence. The first railroad in the county extended from Florence to Decatur and was run by horse power on rails of wood. The town was founded in 1818. Pop. 1900, 6,478

Flo'res (or Floris), an island of the Indian Archipelago, one of the chain which extends east from Java. It is about 230 mi. long and from 15 to 35 mi. wide, and has a mountainous surface, with several volcanic peaks. The natives are tall and robust, frizzly-haired savages, belonging to the dark, Papuan race. The island is under Dutch supremacy. Sandalwood, beeswax, and horses are exported.

Flo'res, the most westerly island of the Azores, about 30 mi. long by 9 mi. broad, with a hilly surface. The chief products are wheat,

pulse, and poultry, and great numbers of small cattle are reared. Pop. about 10,000.

Florian, St., the patron saint of Poland, b. about 190, d. by drowning during the Diocletian persecution, 230. He is represented as pouring out flames from a vessel, and his protection is sought against fire.

Flor'ida, one of the United States, forming the southeastern extremity of the country, and having the Gulf of Mexico on the south and west, and the Atlantic on the east. It consists partly of a peninsula stretching s. for about 400 mi., partly of a long, narrow strip of land running along the Gulf of Mexico to a distance of 350 mi. from the Atlantic coastline. The peninsula is about 90 mi. in width, and contains about four fifths of the total area, which is 59,268 sq. mi. The surface is in general level, rising little above the sea, especially in the southern parts, where it is almost one continued swamp or marsh. The northern portion is more broken and elevated, but the whole coast is flat. The principal river is the St. John's, flowing northward through peninsula of Florida to the Atlantic. Its tributary, the Ocklawaha, has its course so flat that for a long distance it spreads out into the forest for half a mile or more on either side, so that nothing is seen but trees and water. The Appalachicola, Suwanee, etc., flow into the Gulf of Mexico. There are many lakes throughout the peninsula, the largest being Okeechobee (area 650 sq. mi.). Numerous islands are scattered along the south and west coasts, the most remarkable of which is a group, or rather a long chain, called the Florida Keys, at the southern extremity of Florida. The most important of these is Key West, containing the city and naval station of same name.

Climate.—Florida, except in the vicinity of the swamps, possesses one of the most equable and agreeable climates of the continent. Occupying, as it does, a situation between the temperate and tropical regions, it enjoys exemption from the frosts and sudden changes of the one, and the excessive heat of the other. The mercury, however, sometimes falls to the freezing point, and great damage is done to the orange plantations. The winter climate of the Gulf coast is more rigorous than that of the Atlantic. The seasons partake of the tropical character, winter being distinguishable by copious rains. Statistics show the state to be one of the healthiest, if not the healthiest, of the U. S., and its resident population is largely increased in the winter months by invalids from the north, seeking a more genial clime. Jacksonville, St. Augustine, and Key West are preferred by this class of visitors, who are every year becoming more numerous. The mean winter temperature as observed at Key West was slightly less than that of Havana; while for the months from July to November it was about the same.

Vegetation.—The productions of Florida are of an essentially tropical character; cotton, tobacco, rice, sugar cane, arrowroot, hemp, flax, coffee, and the cocoanut flourish there. The climate is also favorable to the cultiva-

tion of the silkworm and for the cochineal insect. Oranges, lemons, bananas, limes, olives, grapes, pineapples, grow abundantly, and are of exquisite flavor. Indian corn, sweet potatoes, beans, peas, and such products of a more northern climate as Irish potatoes, barley, buckwheat, hops, etc., are also raised. The cultivation and export of oranges and other fruits has grown to be a considerable source of wealth to the state; and the manufacture of cigars, especially at Key West, is an important industry. The pasturage afforded by the savannas is excellent, cattle requiring little or no attention from their owners, and no housing in winter. Game and fish abound in every part of the state. Deer, wild turkeys, partridges, geese, ducks, and other small game are in all the forests and about all the lakes, rivers, and swamps; green turtle, oysters, sheep's head, red-fish, mullet, etc., are found on all the coasts, and fresh-water fish in all the inland waters. Magnificent sponges are gathered along the reefs, and form a considerable item of trade. Cotton, rice, sugar, tobacco, lumber, fish, and fruits may be considered the most valuable products.

The wool grown in Florida is long-stapled, of medium and coarse grades, little attention being as yet given to producing fine wools.

Mining.—There are considerable deposits of phosphates in various parts of the state which have been recently discovered. Some of the beds are 30 feet in thickness. The phosphate can be mined and placed ready for shipment for about fifty cents per ton. The mining was first started in the counties bordering on the Gulf, but the industry has increased and additional discoveries have been made so that there is scarcely a county in the state in which phosphate may not be found.

Manufactures.—The industries of Florida include the production of pine and other lumber, and live oak timber for shipbuilding. The preparation of naval stores, turpentine, tar, resin, and pitch employs a large per cent. of the population. Cigars are manufactured in large quantities and along the coast are valuable fisheries. Oysters abound in many parts. Other important industries are the production of cotton-seed oil and meal, the manufacture of fertilizers, and sponge and coral fisheries. In manufactures Florida ranks thirty-ninth in the Union.

Railroads.—The state is traversed by numerous railroads, among which are the Florida R. R. & Navigation Co.; Florida Central & Peninsular; Savannah, Florida & Western; Jacksonville, Tampa & Key West; South Florida; and Florida Southern.

Education.—There is a state agricultural college at Lake City; DeLand College; East Florida Seminary; West Florida Seminary; and Rollins College. There is also a state normal college for whites at DeFuniak Springs; a state normal college for colored teachers; a state asylum for the insane at Chattahooche, and a state asylum for the blind, deaf, and dumb at St. Augustine. The common school system is popular and efficient. There are over 2,000 public schools with an enrollment of about 98,000 pupils.

History.—Florida was discovered on Easter day in 1512 by Ponce de Leon and was settled by De Soto in 1539. In 1560 a party of French Calvinists were butchered by the Spaniards. Until 1763 Florida was in possession of Spain and in that year it was ceded to England in exchange for Cuba. Spain regained the country in 1781. Florida was ceded to the U. S. as a territory in 1819, and was admitted to the Union in 1845. It was the scene of a desperate war between the Seminole Indians and white settlers, 1835–1842. Florida was one of the seceding states in 1861. The principal towns are, Jacksonville, Key West, Pensacola, and Tampa. The popular name of the state is the Everglade State. Population in 1900 was 528,542.

Governors.—William D. Moseley, 1845–49; Thomas Brown, 1849–53; James E. Broome, 1853–57; Madison S. Perry, 1857–61; John Milton, 1861–65; William Marvin, 1865–66; David S. Walker, 1866–68; Harrison Reed, 1868–72; Ossian B. Hart, 1872–74; M. L. Stearns, 1874–77; Geo. F. Drew, 1877–81; Wm. D. Bloxham, 1881–85; Edward A. Perry, 1885–89; F. P. Fleming, 1889–93; H. L. Mitchell, 1893–97; W. D. Bloxham, 1897–1901; W. S. Jennings, 1901.

Florida, Gulf of, the narrow sea between Florida, Cuba, and the Bahama Islands.

Florid Gothic, that highly enriched variety of Gothic architecture which prevailed in England in the fifteenth and at the beginning of the sixteenth century; often called the *Tudor style*, as it prevailed chiefly during the Tudor era.

Florin, a name given to different coins of gold or silver of different values, and to moneys of account, in different countries. The English florin is 2*s.* or one tenth of a pound sterling; the Austrian *gulden* or florin and the *guilder* or florin of Holland are each 1*s.* 8*d.* A gold florin, value 6*s.*, was used in England in the reign of Edward III.

Florus, Annæus, a Roman historian, was probably a native of Spain or Gaul. He lived in the beginning of the second century after Christ, and wrote an epitome of Roman history in four books, from the foundation of the city to the first time of closing the temple of Janus, in the reign of Augustus.

Flotow (flō′tō), Friederich Adolphus von (1812–1883), German musical composer. His *Naufrage de la Méduse* was successfully produced at the Renaissance Theater in 1839. This was followed by *L'Esclave de Camoëns* (1843), and *L'Ame en Peine* (1846), performed in London as *Leoline*. *Alessandro Stradella* was performed at Hamburg in 1844, and his most successful work, *Martha*, at Vienna in 1847.

Flotsam, Jetsam, and Ligan, in law. *Flotsam*, or *floatsam*, is derelict or shipwrecked goods floating on the sea; *jetsam*, goods thrown overboard which sink and remain under water; and *ligan*, goods sunk with a wreck or attached to a buoy, as a mark of ownership.

Flounder, is one of the most common of the flat fishes, and is found along the shores of

almost all countries. The body is extremely flattened at the sides. Flounders have been successfully transferred to fresh-water ponds. They feed upon crustacea, worms, and small fishes, and are much used as food. The Argus flounder is a native of the American seas.

Flour, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. The quality of flour depends principally on the fineness of the sieves through which it is passed and the amount of bran which it contains. The finest flour is obtained in the first grinding of the wheat. The other kinds—biscuit flour, middlings, seconds, etc.—consist of the flour which remains after the first grinding, ground and passed through coarser sieves.

The process of manufacturing flour in modern flour mills is as follows: The wheat is run from the cars into the tin carrying cups of an elevator belt, which lift it to the top of the building and dump it into bins. When needed it is let out, by means of spouts, into the machines which prepare it for grinding. It is forced first in a slow, steady stream into the mouth of a device known as the wheat separator and oat extractor. As it falls downward a blast of air strikes it, and the chaff and light dirt are blown away. The wheat falls upon a sieve set at an incline and passes through the meshes. Grains of corn, oats, and pieces of straw are thus separated from the wheat. After passing through three such sieves, the wheat strikes a fourth, in which the perforations are so small that only the bits of clay and small seeds go through, and the wheat itself is carried over into a spout, which carries it along to the cockle separator. Cockle is a rough, black seed which, if ground in with the flour, makes it dark and unwholesome. The device for removing this from the wheat consists of a round cylinder, the inside of which is full of small indentations, large enough to catch and carry a cockle seed, but too small for a grain of wheat. When the wheat is inside, therefore, and the cylinder revolves, the cockle is carried up in the indentations, and falls out upon the catch board. The cylinder being set at an angle, the wheat slides out by itself.

The next machine is a cylinder, in which a wire brush revolves very rapidly. As the wheat goes through the fuzz at the end of the kernel, every particle of dirt from the crease is wiped out and sucked away into an air shaft. From this machine the wheat passes in a steady stream over some powerful magnets so as to draw out any bits of iron wire, nails or screws which may have fallen into the grain from the harvesters or threshers.

The wheat is now clean and ready to be crushed. There are five sets of cylinders, in the first of which the spiral corrugations on the rolls are comparatively coarse, so that the wheat will simply be broken open longitudinally. The other sets grow progressively finer and are set much closer together. From the rolls the crushed wheat goes up to be scalped.

The machines used in most mills for this purpose are centrifugal reels covered with wire cloth and silk gauze, the meshes of which vary in size. The crushed wheat is thrown at the sieves by centrifugal force and many impurities are removed. One of these machines consists of a long flat box full of sieves set at an incline and perforated with graduated meshes. The whole device is given an eccentric motion by being fastened a few inches at one side of the center to a great wheel. By this means of jolting it the crushed wheat is rattled through the sieves and graded according to the size of mesh through which it passes. The middlings or crushed wheat is now carried on to the middlings purifier, the invention of which a few years ago revolutionized the whole art of milling. Its work is to remove the impurities and the bran from the flour. It accomplishes this purpose by subjecting the passing stream of middlings to air blasts of varying force. The light dust and bran are carried upward and caught in little pockets and the purified middlings pass back to the second set of rollers where they are crushed again. This circuit of processes, the rollers, the plansifter, and the middlings purifier, is repeated five different times, and the separation and grinding is then complete. The flour from the last process is carried down stairs where it is run into sacks. The bran, after passing through a machine which brushes off the remaining particles of flour, goes through a chute of its own and is bagged.

One of the most important machines in a mill is the dust collector. Before it was invented the air of mills was always full of flying particles of flour which sometimes exploded with all the force of gunpowder. The dust collector is a fan, which, in creating a vacuum, sucks the flour out of the air and deposits it in a chamber by itself. This dust is used in inferior grades of flour.

Flower, in popular language, the blossom of a plant, consisting chiefly of delicate and gayly-colored leaves or petals; in botany, the organs of reproduction in a phenogamous plant. A complete flower consists of *stamens* and *pistils* together with two sets of leaves which surround and protect them, the *calyx* and *corolla*. The stamens and pistils are the essential organs of the flower. They occupy two circles or rows, the one within the other, the stamens being in the outer row. The stamens consist of a stalk or *filament* supporting a roundish body, the *anther*, which is filled with a powdery substance called the *pollen*. The pistil consists of a closed cell or *ovary* at the base, containing *ovules*, and covered by a *style* which terminates in the *stigma*. These organs are surrounded by the corolla and calyx, which together are called the *floral envelope*, or when they both display rich coloring, the *perianth*. The leaves of the corolla are called *petals*, and those of the calyx *sepals*.

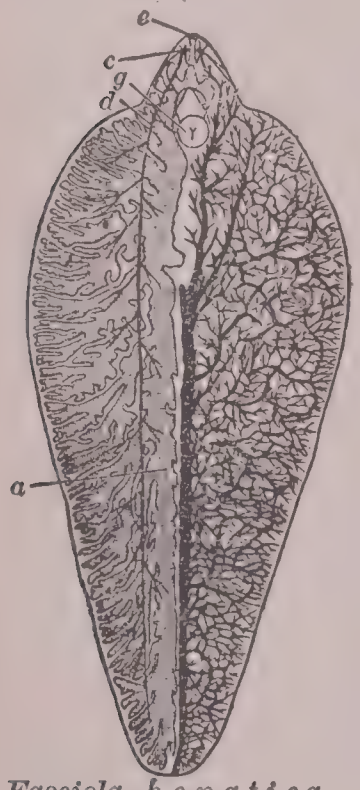
Flowering Fern, one of the noblest and most striking of our ferns, and grows in boggy places and wet margins of woods. It derives its name from the upper pinnæ of the fronds being trans-

formed into a handsome panicle covered with sporangia.

Flowers, ARTIFICIAL, imitations of real flowers, made of various materials. These are not a modern invention. The Romans excelled in the art of imitating flowers in wax, and in this branch of the art attained a high degree of perfection. The Egyptian artificial flowers were made of thin plates of horn stained in different colors, sometimes also of leaves of copper gilt or silvered over. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by American, English, and French manufacturers, but more especially by the latter. Among materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, feathers, india rubber, blown glass, mother of pearl, brass, etc.

Fluid, a body whose particles on the slightest pressure move and change their relative position without separation: a liquid or a gas, as opposed to a *solid.* Fluids are divided into *liquids*, such as water, and bodies in the form of water, and *gaseous bodies* or aeriform fluids. Liquids have been also termed *non-elastic fluids*, for although they are not altogether void of elasticity, they possess it only in a small degree. Air and aeriform bodies have been called *elastic fluids* on account of their great elasticity.

Flukes (or Fluke-worms), a name given to certain tapeworms, etc. They inhabit various situations in different animals—mostly in birds and fishes. The *Distöma hepaticum* exists in large numbers in the livers of sheep, and causes the disease known as "rot." Like the tapeworm, the flukes pass through an elaborate development.



Fasciola hepatica, from the ventral surface (after Sommer).
The alimentary and nervous systems only are shown on the left of the figure; the excretory system alone on the right side; *a.*—right main division of the alimentary canal; *c.*—lateral ganglion; *d.*—lateral nerve; *e.*—mouth; *g.*—ventral sucker.

Fluores'cence, a name given to the phenomena presented by the invisible chemical rays of the blue end of the solar spectrum when they become luminous and visible by being sent through uranium glass, or solutions of quinine, horse-chestnut bark, or *Datūra Stramonium.* In this way green crystals, as of flour spar, may give out blue rays, due not to the color of the surface of the body, but to its power of modifying the rays incident on it. The phenomenon appears to be identical with *phosphorescence.* It is due to the refrangibility of the rays being lowered or degraded by the action of the substance. The term fluorescence is applied to the phenomenon if it is observed while the body is actually exposed to the source of light; *phosphorescence* to the effect of the same kind, but usually less intense, which is observed after the light from the source is cut off. Both forms of the phenomenon occur in a strongly marked degree in the same bodies. Canary glass, which is colored with oxide of uranium, is a very convenient material for the exhibition of fluorescence. A thick piece of it held in the violet or ultra-violet portion of the solar spectrum is filled to the depth of from ⅛ to ¼ of an in. with a faint nebulous light. If the solar spectrum be thrown upon a screen freshly washed with sulphate of quinine, the ultra-violet portion will be visible by fluorescence; and if the spectrum be very pure, the presence of dark lines in this portion will be detected.

Flu'orine, a very widely distributed element which is known chiefly only in combination, though it has recently been isolated by De Moissan as a colorless gas, that attacks almost every substance and is the most active element known. Its most abundant compound is calcic fluoride, which not only exists in the mineral kingdom as fluorspar, but forms an essential part of the bones and teeth of animals. Fluorine has also been detected in the blood, milk, and urine; in plants; in volcanic sublimates; in rocks; in coprolites and mineral phosphates; and in a variety of minerals. Combined with hydrogen it forms hydrofluoric acid.

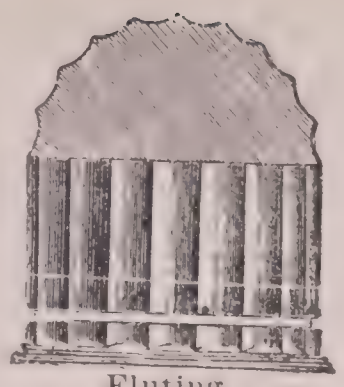
Fluor-spar (or Fluorine), fluoride of calcium. It is of frequent occurrence, especially in connection with metalliferous beds, as of silver, tin, lead, and cobalt ores. It is sometimes colorless and transparent, but more frequently it exhibits tints of yellow, green, blue, and red. From the general prevalence of a blue tint in the Derbyshire specimens it is there known as *Blue-john.* It is used as a flux in metallurgy; and is a source of hydrofluoric acid. Its specific gravity is 3.14, but it is of very inferior hardness (4), being scratchable by apatite.

Flushing, Queens co., N. Y., on Flushing Bay (Long Island Sound), 9 mi. e. of New York City. Railroad, Long Island. Industries: tool works, dye-extract works, glass works, and large nurseries and gardens. Now the Third ward of Greater New York.

Flute, a portable musical instrument, consisting of a tube furnished with six holes for the fingers, and from one to fourteen keys, which open other holes. The sound, which is soft and clear in quality, is produced by blowing with the mouth into an oval aperture at the side of the thick end of the instrument. Its useful compass is about two and a half octaves, including the chromatic tones. It is usually made in four pieces, and of box or ebony, sometimes, however, of ivory, silver, or even of glass.

Fluting, in architecture, channels or furrows cut perpendicularly in the shafts of columns. It is used in the Doric, Ionic, Corinthian, and Composite orders, but never in the Tuscan. When the flutes are partially filled up by a

smaller round moulding they are said to be *cabled.*



Fluting.

Flux, a substance or mixture added to assist the fusion of minerals. In the large way, limestone and fluor-spar are used as fluxes. In the smelting of iron the flux must be such that it will combine with the earthy matter of the ore, and form a slag, which must neither be too refractory nor fusible. The fluxes made use of in assays or chemical experiments consist usually of alkalies and alkaline salts, as borax, cyanide of potassium, carbonate of potassium, carbonate of sodium, common salt, which render the earthy mixtures fusible by converting them into glass. The fluxes used in pottery are various, but almost all consist of litharge, or red lead, borax, carbonates of potassium and sodium, and sand.

Fly, a winged insect of various genera and species, whose distinguishing characteristics are that the wings are transparant and have no cases or covers. By these marks flies are distinguished from beetles, butterflies, grasshoppers, etc. The true flies or Diptera have only two wings, viz., the anterior pair. In common language, *fly*, is the house fly, of the genus *Musca.* The house fly is found wherever man is, and in hot weather causes a good deal of annoyance. It is furnished with a suctorial proboscis, from which, when feeding on dry substances, it exudes a liquid, which, by moistening them, fits them to be sucked. From its feet being beset with hairs, each terminating in a disc which is supposed to act as a sucker, it can walk on smooth surfaces, as a ceiling, even with its back down. The female lays her eggs in dung or refuse; the larvæ are small white worms. They change into pupæ without casting their skins, and in from eight to fourteen days the perfect fly emerges. The very small flies and the very large ones often seen about houses belong to other species.

Flycatcher, a name originally given to certain insessorial birds, with a bill flattened at the base, almost triangular, notched at the upper mandible, and beset with bristles. Two species are British—the spotted flycatcher, and the pied flycatcher, both about the size of a sparrow. They perch on a branch, where they remain immovable watching for insects, only leaving to make a sudden dart at a passing fly, which they seize with a snap of the bill, and then return. The white-collared flycatcher is a native of Southern Europe. Numerous other birds receive the name of flycatchers, and some, as the paradise flycatchers of the Old World, are brilliantly colored. In America some of the tyrant birds are named flycatchers.

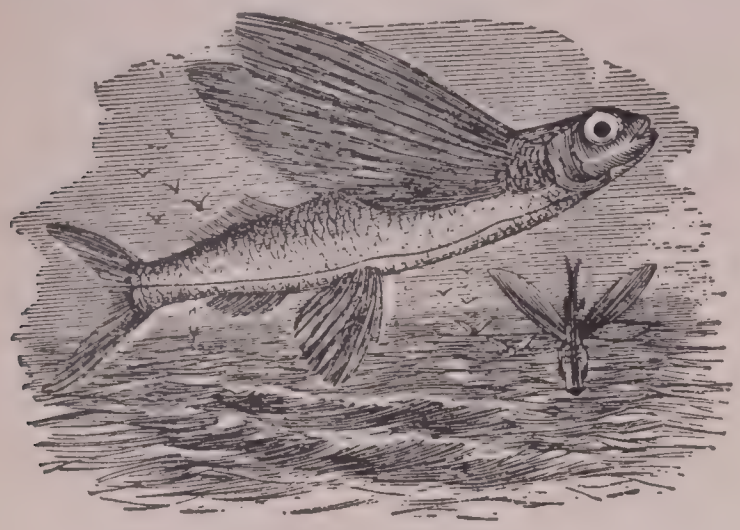
Spotted and Pied Flycatchers.

Flying, the power of locomotion through the air, possessed by various animals in different degrees. Birds, bats, and many insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree frogs, and flying fish can move through the air in one direction for a short time, but cannot, strictly speaking, fly. The wing of a bird or insect is an elastic flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forward and downward, and the bird quickly ascends. It has been shown that the wing describes a figure 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and toward the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained.

Flying Dutchman, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill luck. One form of the legend has it that the ship is doomed never to enter a port on account of a horrible murder committed on board; another, that the captain, a Dutchman, swore a profane oath that he would weather the Cape, though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in rounding the point. He sometimes hails vessels and requests them to take letters home from him. The legend is supposed to have originated in the sight of some ship reflected from the clouds. It has been made the groundwork of one or two novels, and an opera by Wagner.

Flying Fish, a name common to various fishes which have the power of sustaining themselves for a time in the air by means of their large pectoral fins. Generally, however, the name is limited to the species of the genus,

which belongs to the family of mackerel-pikes. The pectoral fins, which are very large, are the principal instruments in their flight, serving to sustain the fish temporarily in the air after it has acquired an initial velocity in its rush through the water. It can pass through the



Flying Fish.

air to a considerable distance, sometimes as much as 200 yards, which it does to escape from the attacks of other fishes, especially the dolphin. It is most common between the tropics.

Flying Machines.—Scientists who are seeking the possible solution of the last transportation problem remaining for man to evolve—that of safely sailing through the air—divide themselves into two classes: "Aeronauts" who believe that success will come through some form of *navigable balloon*, and "Aviators," who point to the birds, and hope for success by purely mechanical means. The first believe that the apparatus should be lighter than the air, the second believe that the apparatus must be heavier than the air.

A measurable success has been attained with navigable balloons, which commonly are called "air ships." The common understanding of flying machines relates to the apparatus used by men who have taken soaring birds as their models, and recent progress in the art of navigating the air has shown that the successful, practical, flying machine is not far off. The brilliant successes of Otto Lilienthal, who unfortunately fell a victim to his intrepidty in 1897, of Professor Langley of the Smithsonian Institution, of O. Chanute of Chicago and others and the invaluable information and experiences secured by the modern practise of scientific kiteflying, indicate that the flying machine, based on the principles which enable a bird to soar, is a near probability. Otto Lilienthal, a German aviator, may be regarded as one of the very first to actually "fly." His flying apparatus consisted of wooden frames, very much like the outspread pinions of a bird, covered with cotton drilling. The frame was grasped by the hands of the aviator, the arms rested on cushions on a crossbar, leaving the legs dangling free for running and jumping. By throwing the legs from one side to the other, a change in direction was secured. The four wings, one pair above the other, formed aeroplanes, giving 180 sq. ft. of surface, with a spread of 18 ft., measuring from tip to tip. The steering rudder, or tail of the machine, also had horizontal planes. The machines weighed from 35 to 55 pounds. Some Lilienthal used with immovable wings, simply to experiment in soaring, and others had flapping wings, which enabled him, on a still day, to fly forward and sometimes upward. Herr Lilienthal actually took flights for long distances, launching himself in the air from the top of a hill, and sometimes soaring higher than the altitude of the starting place.

Flying Machines

Hiram Maxim, the inventor of the Maxim gun, invented an aerial machine 8 ft. wide and 40 ft. long, equipped with screw propellors, actuated by a steam engine which was astonishingly small for the power developed. With this apparatus Maxim proved conclusively that a flying machine was practical. In May, 1896, Professor Langley, secretary of the Smithsonian Institution, accomplished mechanical flight by means of his "aerodrome." The apparatus was a model, and was flown "unmanned." It performed all the maneuvers required for a practical flying machine, in that it rose, sailed forward, upward, and turned on itself. The aerodrome ascended in a spiral path, and it is probable that flying machines, in the future, will gain height in a spiral path. The common theory that large birds elevate themselves by repeatedly flapping their wings downward thereby producing a reacting pressure of the air equal to their weight is not held by aviators. It is the more advanced theory of Professor Langley and others, that large birds cannot support themselves in this way; but that they travel almost entirely by soaring. Birds have tricks of their own in beginning flight. Many run some distance on the ground, or dive off high places in starting, while in landing they use their wings as parachutes, and their legs and toes as springs.

O. Chanute, a retired and well-known civil engineer of Chicago, Ill., began studying "aerial navigation" some years ago. In the summer of 1896 he carried on a series of elaborate experiments near Chicago and succeeded in soaring considerable distances with his aeroplanes. For 400 years efforts have been made to master the air by means of apparatus constructed for the purpose of mechanical flight. The flying machine antedates the balloon. The aviators of the present day may be divided into three classes: those who construct apparatus in imitation of the flapping action of the wings of birds; those who seek to sustain weight and obtain progress simultaneously through the air by horizontal screws, and those who seek to sustain weight by means of aeroplanes and progress by means of screws.

The question of motive power has been a most difficult one for aviators to answer. Four classes of motors have been used: steam, gas, compressed air, and electricity. Maxim, Hargrave, and others have built steam engines which weigh less than 10 pounds for each horse power developed. But fuel and water

must be carried, and the question is still unsolved. These supplies may be estimated at 22 pounds of water and 4 pounds of coal per horse power per hour. It is proposed to use the water over and over again by condensing it in a suitable condenser, but this adds weight to the apparatus. Other motors are about as heavy, and a storage battery for an electric motor is actually heavier than a primary battery.

The Zeppelin Air Ship.—The Zeppelin air-ship, devised by Count von Zeppelin, was given its first trial July 2, 1900, on Lake Constance, Germany. This immense balloon, or series of balloons, is 410 feet long. The supporting body is a cylinder thirty-nine feet in diameter, the ends tapering off like a cigar. The skeleton frame of this cylinder is made of aluminum, and is divided into seventeen compartments, each of which contains a balloon. These balloons are independent of each other, so that in case of accident to one or more of them the rest will remain intact. The entire framework is surrounded by a netting of ramie-fiber cord which is still further protected by an outer water-tight envelope. This serves to protect the balloons from rain or the direct rays of the sun. The ship can be moved either forward or backward by means of two sets of aluminum propellers, two at each end of the cylindrical body, somewhat below the central axis. The ship is steered by rudders placed at the front and rear ends.

Beneath the cylindrical body are two aluminum cars, each located beneath a pair of propellers. These cars are 21.32 feet long and 5.96 feet wide. In each car is a benzine motor by means of which the propellers are driven. The cars are connected by a bridge two feet wide, thus affording a passage for the crew from one car to the other. Beneath the cars and connecting passage a cable is loosely suspended, to which a sliding weight is secured. By adjusting the position of the weight, the ends of the ship can be raised or lowered. When the weight is shifted to the rear, the front end of the air-ship is raised, and the air pressing on the under surface forces the ship upward. When the weight is shifted to the front, the rear end is elevated, and the ship descends owing to the pressure upon the upper surface.

Each of the engines gives sixteen horse-power, with 700 revolutions a minute, and weighs only 715 pounds. It is estimated that the air-ship will attain a velocity of twenty-six feet a second, or about seventeen miles an hour. In the first trial, the ship rose 1,300 feet and traveled three and three-quarters miles in seventeen minutes.

Fly Wheel, a wheel with a heavy rim placed on the revolving shaft of any machinery put in motion by an irregular or intermitting force, for the purpose of rendering the motion equable and regular by means of its momentum. A fly wheel is also used as an accumulator of force; thus when a small steam engine sets in motion a very large fly wheel, the wheel acts as a reservoir of all the small pressures which have been communicated to it, and having thus concentrated them can apply them all together and at once when some great effect is to be produced.

Focus, 1, in optics, a point in which any number of rays of light meet after being reflected or refracted by a mirror or a lens; 2, in geom. an important point on the principal axis of the parabola, ellipse, and hyperbola. The ellipse and hyperbola have each two foci, the parabola one, though in the latter case we may suppose a second focus at an infinite distance. The foci were so called from the fact that rays of light proceeding from one focus and reflected from a corresponding reflecting surface pass through the other focus.

Fog, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapor of the atmosphere into minute watery particles, this condensation being caused by a cold current of air, or the contiguity of a cold surface. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day. The disagreeable pungency of the fogs in large towns is due to the presence of smoke and other impurities. Recent experiments would seem to show that there is an intimate connection between fogs and the invisible dust of the atmosphere; that in fact the invisible atmospheric dust is not only necessary to the formation of fogs, but also of clouds and rain. Fogs have beneficial effects in partially purifying the atmosphere.

Fog Signals, signals given by means of sound to warn vessels during fogs, when lights or other visible signals cannot be perceived. Various kinds of fog signals are used, among which may be mentioned bells, drums, gongs, guns, compressed-air whistles, steam whistles, and fog trumpets or horns. One of the most powerful signals is the siren fog horn, the sound of which is produced by means of a disc perforated by radial slits made to rotate in front of a fixed disc exactly similar, a long iron trumpet forming part of the apparatus. The discs may each contain say twelve slits, and the moving disc may revolve 2,800 times a minute; in each revolution there are of course twelve coincidences between the slits in the two discs; through the openings thus made steam or air at a high pressure is caused to pass, so that there are actually 33,600 puffs of steam or compressed air every minute. This causes a sound of very great power, which the trumpet collects and compresses, and the blast goes out as a sort of sound beam in the direction required. Under favorable circumstances this instrument can be heard from twenty to thirty miles out at sea. Fog signals are also used on railways during foggy weather; they consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it comes up to them.

Fokien, a maritime province of Southeastern China; area 53,480 sq. mi. (inclusive of Formosa, which now is administratively separate). The coast is deeply indented by bays and stud-

ded with islands. The interior is generally mountainous, but is highly cultivated and generally fertile. The principal products are rice, wheat, barley, tea, silk, sugar, indigo, camphor, and tobacco. The capital is Foo-choo-foo. Pop. 25,790,556.

Fokschani (-shä′nē), a town of Roumania, on the Milklov, 104 mi. n. e. Bukarest, with an important trade. Pop. 25,290.

Foley, John Henry (1818–1874), sculptor, b. in Dublin. His works are numerous and highly esteemed. They include statues of Selden and Hampden in Westminster; Goldsmith, Burke, and O'Connell in Dublin; Lord Hardinge and Outram for India; Lord Clyde in Glasgow; the group *Asia* and the colossal statue of Prince Albert for the Albert Memorial, Hyde Park. Foley was buried in St. Paul's Cathedral.

Folkestone (fōk′ston), a seaport, England, county Kent, 6 mi. w. by s. of Dover, terminus of the Southeastern Railway, and a chief station for steamers to and from Boulogne. It is a favorite watering-place, and has a considerable shipping trade. Folkestone is included in the parliamentary borough of Hythe. Pop. 23,700.

Folk-lore, a useful term of recent introduction into the English language, signifying a scientific study of popular tales, traditions, primitive beliefs, and superstitions, popular customs, usages, festivals, games, etc. Folk-lore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies. It is, therefore, of great assistance to the ethnologist, the sociologist, and the historian, as well as to the student of comparative mythology and of the science of religion.

Fomentation, in medicine the application of warm liquids to a part of the body, by means of flannels or other cloths dipped in hot water or medicated decoctions, for the purpose of easing pain by relaxing the skin or of discussing tumors.

Fond du Lac, Fond du Lac co., Wis., on Fond du Lac River and Lake Winnebago, 61 mi. n.e. of Milwaukee. Railroads: C. & N. W. (3 lines); C. M. & St. P.; and Wisconsin Central. Industries: furniture company, two flouring mills, iron foundry, woolen mill, refrigerator, sash, door, cyclometer, table, and farm implement factories. Surrounding country agricultural. The town was first settled in 1835, and became a city in 1852. Pop. 1900, 15,110.

Fontainebleau (fon-tān-blō), a town of France dep. Seine-et-Marne, in the midst of the forest of same name, about 2 mi. from the Seine and 37 mi. s.s.e. Paris. It owes its origin chiefly to the palace, and is a quiet place, with broad, clean streets. Pop. 13,340. The castle or palace of Fontainebleau is one of the most magnificent in France. It occupies the site of a fortified chateau founded by Louis VII in 1162; this was converted into a magnificent palace by Francis I; much added to by Henry

IV, Napoleon I, Louis Philippe, and Napoleon III. The park is laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls. The forest, which is about 50 mi. in circumference, covers an area of 42,500 acres, affords numerous pleasant walks, and abounds with game.

Fontenoy, a village in Belgium, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French, under Marshal Saxe, defeated the British, Austrian, and Dutch allied forces under the Duke of Cumberland.

Foo-chow, a town of China, capital of the province of Fokien, on the Min, 125 mi. n.e. of Amoy. Foo-chow is one of the five ports thrown open by the treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbor is difficult. Foo-chow has a large arsenal and dockyard superintended by European officers; it is also a great literary center. Pop. est. at 630,000.

Fools (Feast of), the name given to festivals regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies. The feast of fools was an imitation of the Roman Saturnalia, and, like this, was celebrated in December. The young people, who played the chief parts, chose from among their own number a mock pope, archbishop, bishop, or abbot, and consecrated him, with many ridiculous ceremonies, in the chief church of the place. They often travestied the performance of the highest offices of the church, while others, dressed in different kinds of masks and disguises, engaged in indecent songs and dances, and practised all possible follies in the church. Except from their association with the Saturnalia nothing is known of the origin of these extravagancies, which appear to have been very ancient. They were most common in France, but the feast was also observed in Spain, Germany, England, and Scotland. In France it survived till the year 1644.

Foo-shan, a town, China, prov. of Quang-tong, 21 mi. s. w. of Canton, on one of the branches of the delta of the Si-kiang. Pop. 200,000.

Foot, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches. *Square foot* is a square whose side is 1 foot, and is therefore equal to 144 square inches. *Cubic foot* is a cube whose side is 1 foot, and the cube contains 1,728 cubic inches. The foot is a common measure in various countries, but its dimensions vary considerably.

Foot, in animals, the lower extremity of the leg; the part of the leg which treads the earth in standing or walking, and by which the animal is sustained and enabled to step; or that surface of the body by which progression is effected among the mollusca. See *Anatomy*.

Foota, a territory of Senegambia, West Africa, on the lower Senegal, which bounds it on the n. e. It includes Foota Toro, and other districts. Area about 15,000 sq. mi.; pop. est.

400,000. The natives profess Mohammedanism, and the country is divided into three districts, each governed by its own chief, subject to a sovereign chosen from a few privileged families. It is now under French influence.

Football, a very general and favorite outdoor game, generally practised at our public schools, colleges, and universities during the colder months of the year. The game is very ancient. The Greeks played it and so did the Romans, the latter in Rugbeian fashion, using their hands as well as their feet. It is supposed to have come into Britain with Cæsar, though there is a legend that the first football was the head of a Dane that was kicked about on the Roodee, at Chester, on Shrove Tuesday. In its early days the game was followed in a very primitive fashion, and in a desperately rough one, without any of the intricacy and manœuvring of modern play. The game has greatly extended its popularity of late years, for while it was formerly confined chiefly to the higher class schools, it is now played in most of the villages and small towns. The American-Rugby game of to-day is played by 22 persons, 11 on a side, with a large elliptical leather ball, on a field 330x160 ft. At each end of the field is a goal made of two posts, 20 ft. high and 18½ ft. apart, with a crossbar 10 ft. above the ground. The end boundaries of the field are known as goal lines. The space beyond these lines and between the extended side lines, is known as a *goal.* The space at the side and between the extended goal lines is called *touch,* and the space at the corners of the field is called *touch-in-goal.* A team consists of 11 persons, viz., seven rushers, a quarter-back, two half-backs, and a full-back. The opposing players face each other and each side tries to carry or kick the ball toward the opposite goal, and either to touch the ball to the ground behind the goal, which is called a *touch-down,* or kick it over the crossbar between the goal posts, which is called *kicking a goal.* The player in the center of the rush line is called *center rush* or *snapper back,* and should be a large, powerful man noted more for strength than fleetness. The players on either side of the *center rush* are called *guards.* Those next to these, *tacklers,* and the farthest ones, *end rushers,* who should be good, all-round athletes. The most responsible position is that of *quarter-back,* as it rests with him to determine the character of each play.

When the game is called the referee tosses up and the winner takes either the kick-off, or choice of goals. The players on each side now stand facing their opponents' goal. The referee places the ball in the center of the field and one on the side having the kick-off kicks it toward the opposite goal. When it is kicked it is said to be *in play.* Until the ball is kicked, all on the kicking-off side must stand on or behind the line through the center of the field and all on the opposite side must stand ten yards or more before the ball. The player who next gets possession of the ball can either kick it, run with it, or throw it to some other player on his own side, but must be careful to throw it sideways or back and not straight or diagonally forward. If he chooses to run with it the players on the other side may try to stop him by seizing or tackling him anywhere above the knees or below the shoulders. He may try to keep them off by pushing with his open hand but not with his fist. If he be tackled and the ball fairly held, the umpire calls *down* and the men line up for what is called a *scrimmage.* The opposing rushers form into two lines facing each other, each on their own side of the ball. The center rush on the same side as the one who put the ball down, takes it and snaps it back to the quarter-back who passes it to another player on his own side. That player may then try to carry the ball through the opposing line or kick it, but if in three successive downs by the same side the ball is not advanced at least five yards or taken back as much as twenty yards, it must be surrendered to the opponents on the next failure to advance, or must be kicked. When the ball is kicked, any player on the opposite side who catches it fairly without stepping from his place, at the same time making a mark with his heel on the ground, is entitled to what is called a *free kick.* The opposing players may then come to the mark but must not pass it until after retiring as far as he wishes, the one who made the catch kicks it. When one side succeeds in getting the ball near enough to the opponents' goal, a player on that side may try to kick the goal which he may do in any way except by *punt,* or may touch the ball down *in goal.* This is called a *touch-down.* His side then has a *try at goal,* by either *place kick* or *punt out.* When either side is hard pressed and near its own goal, it may gain an advantage by taking the ball back across the goal line and making what is called a *safety.* After this the ball can be carried straight out twenty-five yards from the goal line and kicked. The *safety* counts against the side making it. The game consists of two halves each 45 minutes long, and an intermission of 10 minutes. The side which scores the largest number of points wins. The officials in the game are a referee, an umpire, and two linesmen. It is the referee's business to keep track of the ball; the umpire's business to watch the men and see that there is no fouling; the linesmen's business is to note the advances and losses of either side.

In the Association game the upright poles are 8 yards apart, and joined at 8 feet from the ground by a tape, under which the ball must pass to secure a goal.

Foot-pound, in physics, the term expressing the unit selected in measuring the work done by a mechanical force. A foot-pound represents 1 lb. weight raised through a height of 1 ft.; and a force equal to a certain number of foot-pounds, fifty for example, is a force capable of raising 50 lbs. through a height of 1 ft.

Foot Rot, a disease in the feet of sheep, the more common form of which is an inordinate growth of hoof, which at the toe, or round the margin, becomes turned down, cracked, or torn, thus affording lodgment for sand and dirt. In the second form of the disease the

foot becomes hot, tender, and swollen; there are ulcerations between the toes, followed by the sprouting of proud flesh.

Foraker, JOSEPH B., b. in 1846, in Ohio. He entered the Union army at the age of sixteen and served until the end of the war. He graduated from Cornell University in 1869, and the same year began the practise of law in Cincinnati. He was judge of the superior court of Cincinnati 1879–82. He was governor of Ohio 1886–1890, and was elected U. S. senator in 1896.

Forbes, DUNCAN (1685–1747), of Culloden, Scottish lawyer, lord-president of the Court of Session. He studied law at Edinburgh and Leyden; was called to the bar in 1709, and immediately after appointed sheriff of Midlothian. In 1734, in consequence of the death of his brother, he fell heir to the estate of Culloden. He devoted himself to the improvement of the industry of Scotland, and materially aided in laying the foundations of that commercial prosperity to which his country has since attained. He also effected many improvements in the procedure of the Court of Session.

Forbes, EDWARD (1815–1854), British naturalist, was b. at Douglas, Isle of Man. He early devoted himself to science, and having made scientific journeys in Norway, Sweden, France, Germany, etc., he was attached to a scientific expedition to the Mediterranean, the result of which appeared in a report presented to the British Association, and in *Travels in Lycia.* In 1853 he was appointed to the chair of natural history in Edinburgh. Among his more important works, which include a great number of valuable papers on zoological, botanical, and literary subjects, are a *History of the Starfishes* and *History of British Mollusca.*

Forbes (forbz or for'bes), JAMES DAVID (1809–1868), Scottish scientist. His fame rests chiefly on his study of glaciers. His chief publications upon this subject are: *Travels Through the Alps of Savoy; Norway and Its Glaciers; Tour of Mont Blanc and Monte Rosa;* and *Occasional Papers on the Theory of Glaciers.* Forbes's theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts.

Forbes, SIR JOHN (1787–1861), a Scottish physician, a homœopathist, phrenologist, and believer in mesmerism. His first works were his translations of the writings of Avenbrugger and Laennec on auscultation and the use of the stethoscope. To the *Cyclopædia of Practical Medicine,* of which he was joint-editor, he contributed some of the best articles in the work. He was the founder of the *British and Foreign Medical Review,* and published a number of professional and other works.

Forbidden Fruit, a name fancifully given to the fruits of various trees grown in tropical countries, as the shaddock, a sort of thick skinned orange, and the poisonous fruit of a tree of Ceylon, traditionally said to be the fruit of which Adam and Eve ate at the time of the fall in Eden.

Force, that which is the source of all active phenomena occurring in the material world, and of which motion, gravitation, heat, light, electricity, and magnetism, cohesion, and chemical affinity are believed to be exhibitions. Mechanical force is the power which produces or modifies motion or tends to do so. It has its origin in three causes: 1, gravitation; 2, the unknown cause of the phenomena of light, heat, and electricity; and 3, life. Mechanical forces are of two sorts: one of a body at rest, being the same as pressure or tension; the other of a body in motion, being the same as impetus or momentum. When two forces act on a body in the same *line of direction* the resulting force, or *resultant* as it is called, will be the sum of both forces. If they act in opposite directions the body will remain at rest if the forces be equal; or, if the forces be unequal, it will move with a force equivalent to their difference in the direction of the greater. If the lines of direction make an angle with each other the resultant will be a mean force in an intermediate direction. The *composition of forces* is the combining of two or more into one (actually or hypothetically), which shall have the same effect when acting in some given direction; the *resolution of forces* is the decomposing of a single force into two or more forces, which, acting in different directions, shall be equivalent to the single force. Forces have different denominations according to their nature and the manner in which they act; thus we have accelerating forces, constant forces, parallel forces, uniform and variable forces, etc. The *unit of force* is a single force in terms of which the amount of any other force is ascertained.

For'ceps, a general name for a two-bladed instrument on the principle of pincers or tongs, used for seizing and holding, and for extracting objects which it would be impracticable thus to treat with the fingers. Such instruments are used by watchmakers and jewelers in delicate operations, by dentists in forcibly extracting teeth, for grasping and holding parts in dissection, for extracting anything from a wound, taking up an artery, and by accoucheurs.

Forcing, a method of cultivation by which plants, flowers, and fruits are raised at an earlier season than the natural one by protecting them under glass, in hot or cold frames, by using stimulating fertilizers, and other means.

For'dun, JOHN (1300–1386), the father of Scottish history, b. probably at Fordoun, Kincardineshire. He wrote the first five books of his history known as the *Scotichronicon* (in Latin), bringing it down to 1153, and part of the sixth, and left materials for its continuation down to his own period. It was resumed about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun were enlarged, and eleven new ones added, bringing the history down to 1437. It exists in numerous MS. copies, and several printed editions have been published, the best of which is that of W. F. Skene, Edinburgh, 1871–72, with translations.

Forecastle, a short deck in the forepart of a ship of war, or forward of the foremast, above

the upper deck. In merchant ships it is the forepart of the vessel, where the sailors live.

Foreclosure, in law, is the right of a mortgagee, or of any one having interest in a mortgage, in the event of the conditions of the mortgage being violated, to compel the mortgager to redeem the pledge or forfeit his right of redemption.

Foreshortening, in drawing and painting, the art of representing figures in such a manner as to convey to the mind the impression of the entire length of any object which is pointing more or less directly toward the spectator standing in front of the picture. The projecting object is shortened in proportion to its approach to the perpendicular to the plane of the picture, and in consequence appears of a just length.

Forest, a term properly applied to an extensive wood, or to a large tract of mingled woodland and open and uncultivated land; but also given to a large tract of hilly or mountain land wholly or chiefly devoted to the purposes of the chase. Forests proper are of much importance in the general economy of the globe. They greatly affect climate, and their beneficial influence in a physical, economical, and hygienic aspect is now receiving increased attention. For immense forests the reader must look to the Western Continent, where, both in the north and south, the vegetation appears to possess no limits. In the U. S., nevertheless, the forests, though yet of immense extent, are gradually disappearing. In South America, the whole of the valley of the Amazon, which embraces one third of the entire area of that country, is one vast forest. To give an account of the various descriptions of trees would be impossible.

For the preservation of the forests the states of New York, California, Colorado, North Dakota, and New Hampshire have Forest Commissions, and Ohio has a Forestry Bureau. The American Forestry Association, with delegates from all the states, meets annually. State Associations are in existence in Colorado, Kentucky, Minnesota, New York, North Dakota, Ohio, Pennsylvania, South Carolina, and Texas. To encourage forest-planting on the treeless prairies the U. S. government has made tree-planting the consideration for the acquisition of public lands. Thus by cultivating ten acres of trees thereon for eight years the head of a family, or a single person over twenty-one, may acquire title to 160 acres of land provided he be a citizen, or has declared his intention to become one.

For'far (or Angus), a maritime county on the east coast of Scotland, bounded n. by counties Aberdeen and Kincardine, w. by Perth, s. by the Firth of Tay, and e. by the German Ocean; area 568,750 acres. The chief rivers are the N. Esk and the S. Esk. All the operations of agriculture are carried on in the most approved manner, and nearly half the area is under crops. Cattle rearing is carried to great perfection, the chief breeds being shorthorns and polled Angus. The staple manufacture is coarse linens, which is more or less

carried on in all the towns and villages, but has its central locality at Dundee. Sandstone flags are largely quarried in the Arbroath district. Pop. 277,778.

For'feiture, a punishment annexed to some illegal act or remissness of an owner or tenant of property, whereby he loses his interest therein, together with his title, the same going to the party injured by such act or remissness.

Forge, a workshop or other establishment in which iron or other metal is hammered and shaped by the aid of heat; also, the works where iron is rendered malleable by puddling and shingling. For military purposes a traveling forge is used by forces in the field.

Forgery, at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making *malo animo* of any written instrument for the purpose of fraud and deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument. The punishment of forgery at common law is as for a misdemeanor, by fine, imprisonment, and such other corporeal punishment as the court in its discretion shall award. Most, and perhaps all, of the states in the Union have passed laws making certain acts to be forgery, and the national legislature has also enacted several on this subject; but these statutes do not take away the character of the offense as a misdemeanor at common law, but only provide additional punishment in cases enumerated in the statutes.

Forget=me=not, an annual and perennial herb common to the U. S. and to England. Nearly 50 species have been described. Scorpion-grass is also a name for it and others of its genus. It is a very beautiful plant and considered to be the emblem of friendship wherever it is grown. Its flowers are bright blue with a yellow eye. The dark-blue forget-me-not of the Azores is now cultivated in greenhouses, and is much esteemed for the brilliancy of its flowers.

Forget-me-not. *a*.—flower.

Forlorn Hope, a body of men, usually volunteers, selected from different regiments, to lead an assault, enter a breach, or perform other service attended with uncommon peril. The term is of Dutch origin; *hope* being from Dutch *hoop*, a company.

Form, as a metaphysical term, has been defined as the essence of the thing from which result not only its figure and shape, but all its other qualities. Hence it is all that makes a thing intelligible to the mind, in contradistinction to *matter*, thus regarded as a kind of unknown substance or substratum.

Formation, in geology, any series of rocks referred to a common origin or period, whether they consist of the same or different materials. Geological strata are divided into certain groups of one era of deposition, sometimes of very dissimilar mineralogical character, but enclosing the same fossil species.

Formic Acid, an acid obtained from ants, when repeated quantities of them have been infused in boiling water. It is contained in human sweat and urine, in the common nettle and other plants, and may be prepared artificially in various ways. It is a colorless, volatile liquid, with pungent odor, and producing intense irritation on the skin.

Formo′sa, an island in the Chinese Sea, separated from the Chinese prov. of Fokien by a strait about 80 mi. wide where narrowest. The island is about 250 mi. in length and 70 in average breadth. It is divided by a central range of mountains into a western and eastern part, the former of which is occupied by about 500,000 immigrant Chinese, and highly cultivated, producing in abundance corn, rice, sugar, pepper, camphor, oranges, bananas, etc. The eastern part is inhabited mainly by wild tribes of Malayan race, who are gradually disappearing before the Chinese. Four ports have been open since 1860 to European commerce: Tai-wan (the capital), Tamsui, Ke-lung, and Takow; and the trade of the island since then has greatly increased. The chief exports are coal, tea, camphor, sugar, indigo, hemp, timber; the imports are cotton and woolen goods and opium.

Formo′sa, an island in the Atlàntic, forming one of the Bissagos off the west coast of Africa.

For′mula, a mixed form of words or symbols. In theology it is a formal statement of doctrines; in mathematics, a general theorem, a rule or principle expressed in algebraic symbols. In chemistry it is a mode of expressing the constituents of a compound by means of symbols and letters. Thus water is represented by H_2O, in which H_2 stands for the two proportions of hydrogen and O for the one of oxygen which are combined to produce water.

Forrest, Edwin (1806–1872), an American actor, b. in Philadelphia. He showed an early talent for the stage, and in 1820 made his début at Philadelphia as the hero in Home's play of *Douglas*. In 1826 he appeared before the New York public as Othello with signal success. In 1836 he visited England, making a third and last visit in 1845. He continued to act with great success at New York till 1871, when he retired. His chief characters were Othello, Macbeth, Hamlet, and Richard III.

Forster, Johann Reinhold (1729–1798), German writer. He studied theology at Halle, and became preacher at Nassenhuben. He chiefly devoted himself, however, to his favorite studies—mathematics, history, geography, etc. He was invited to accompany Captain Cook in his second voyage as naturalist of the expedition. An account of the voyage was published in his son's name (London, 1777). In 1780 he was invited to Halle as professor of natural history, and continued there until his death.

Forster, The Right Hon. William Edward (1818–1886), English statesman, b. at Bradpole, Dorset, the son of an eminent minister of the Society of Friends. He entered into the woolen trade at Bradford. In 1850 he married the eldest daughter of Dr. Arnold, of Rugby. In 1875 the Liberals, having just returned to power, Mr. Forster accepted the post of chief secretary for Ireland at a time when that country was distracted by agrarian and political tumults. The suppression of the Land League and the arrest of Mr. Parnell and the more violent agitators was carried out by Mr. Forster, but on the government resolving to change its policy and release the Parnellites, Mr. Forster resigned (1882).

Fort Dodge, Webster co., Ia., on Des Moines River, 150 mi. s. of St. Paul. Railroads: Illinois Central, C. R. I. & P., Minneapolis & St. Louis, and Mason City & Fort Dodge. Industries: Stucco works, flour mill, iron foundry, oatmeal mill, brick and tile works, butter-tub, stoneware, and other factories. Surrounding country agricultural; also large deposits of gypsum, and coal, and fire clay. Fort Dodge was the battle ground between the Sioux and Sax Indians in 1853–54. The town was first settled in 1857, and became a city in 1870. Pop 1900, 12,162.

Forth, a river of Central Scotland, formed in Perthshire by the junction of two streams, the Duchray and the Dhu, about 1 mi. w. of Aberfoyle. From Aberfoyle the river flows s.e., forming for a considerable part of its course the boundary between the counties of Stirling and Perth, winding in its lower course in a series of curves known as the *Links of Forth*, and expanding thereafter into the *Firth of Forth*, which forms the most important harbor of refuge n. of the Humber. Length 170 mi.

Forth Bridge, the great railway viaduct which crosses the Firth of Forth at Queensferry, here about 4,000 ft. wide at low water. The small island of Inchgarvie is used as the central support of the two chief spans, which are 1,710 ft. wide each. These spans are each made up of two cantilevers extending toward each other from the opposite sides and connected by a girder, the cantilevers being 343 ft. deep where they rest on the supporting piers, and 40 ft. at the free ends, and projecting 680 ft., while the central connecting girder is 350 ft. in length. There are two other spans of 680 ft. each, fifteen of 168 ft. each, and seven small arches totaling about 400 ft. Including piers there is about a mile of main spans, and over half a mile of viaduct approach. The clear headway under the center of the

bridge is 150 ft. above high water, while the highest part of the bridge is 361 ft. above high water. Each of the main piers consists of a group of four cylindrical granite and concrete piers 49 ft. in diameter at the top and from 60 to 70 ft. at the bottom. The deepest pier is about 70 ft. below low water, and the rise of the tide is 18 ft. at ordinary springs. In the piers there are about 120,000 cubic yards of masonry, and in the superstructure about 45,000 tons of steel. All the foundations are either on rock or on a boulder clay, which for all practical purposes is as hard as rock; and the whole structure presents a network of bracing capable of resisting stresses in any direction and of any probable severity. The bridge carries two lines of rails. It was projected by a company in which the North British, Great Northern, Northeastern, and Midland Railways are interested. The engineers were Sir John Fowler and Mr. B. Baker, C. E., and the contract price was $8,000,000. Operations were commenced in January, 1883, and the work was completed in the end of 1889.

Fortification, the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so that they may be held against the assault of troops supported by artillery. Fortifications are usually divided into permanent and temporary. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, etc. Temporary fortifications are such as are designed merely to throw temporary obstacles in the way of the enemy, as field-works, etc. The former are constructed on the principle that each part must by its fire, support and be supported by some other part; that the works must protect the defenders from the enemy's fire as well as possible, and that the fire of the fortress must completely sweep all parts of the ground in front of the fortified lines. The more important details of a regular fortification may be briefly described as follows: Around the place to be defended is raised a mound or bank of earth called a rampart, on the upper surface of which, the *terre-pleine*, the troops and cannon are placed. The terre-pleine is protected from the enemy's fire by a breastwork or *parapet*, about 8 ft. high, sometimes pierced at certain intervals with *embrasures* through which the guns are fired. Beyond the rampart is the *ditch*, usually about 12 ft. in depth, but varying greatly in width. The ditch is sometimes filled with water; in other cases it is dry. The *scarp* or *escarp* is the inner wall of the ditch, and it is faced with mason work or hurdles, sods, etc., to retain the earth of the rampart in its place. The *counterscarp* is the opposite or outer wall of the ditch. From the top of the counterscarp outward is a space about 30 ft. wide (the *covered-way*) protected by a parapet, the long, superior, outward slope of which toward the

open ground forms the *glacis*. The use of the covered-way is to allow the troops to be drawn up on it unseen by the besiegers for the purpose of making a sortie; it also enables the defenders to keep up a closer fire on the attacking forces. The slope of the glacis is so constructed as to bring the assailants in the direct line of fire from the artillery on the ramparts. At certain intervals there are often bastions or protecting works at salient angles, commanding by their fire the *curtain* or straight portion of the fortified line between them. The use of the bastion has given name to what is called the *bastionary* system of fortification, which has in modern times largely given way to what is known as the *polygonal* or German system, which is considered to have various advantages in relation to the powerful artillery of the present day. The polygonal system has also been called the *caponier* system, from the use of powerful casemated caponiers constructed across the ditches and serving instead of bastions for their defense. The general plan of the works is polygonal, with the ramparts placed on the sides of the polygon. The connecting line of fortifications surrounding a place is called the fortified *enceinte*, and the works in a regular fortress form a very complicated whole, including works to which such names as *ravelins*, *demi-lunes*, etc., are given. The fortified enceinte immediately surrounding a place is not now considered sufficient defense, on account mainly of the long range of modern cannon. Hence it is usual to surround a fortress with a line of detached forts at some distance from the enceinte, or there may be more than one such line of advanced works. Fortifications intended to ward off attacks by sea have their sea-faces now commonly protected by plates of iron or steel. Scientific fortification may be said to commence with the great French engineer Vauban, who served under Louis XIV. He developed the bastion system, which, as improved by Cormontaigue and others, is still the prevailing type of French fortification.

Field Fortifications vary much according to the time allowed for construction, and during which they may prove useful. Among works of this nature are the *redan*, which consists of two parapets, with a ditch in front, forming an angle facing the enemy; the *lunette*, which is a redan with short flanks; the *redoubt*, a closed work with a ditch and parapet all round. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within rifle range. To do this effectually, and to strengthen the whole line, the plan generally adopted is to form an entrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts. When the time is not sufficient to throw up such works, simple forms of intrenchment, such as shelter trenches, are used to shelter troops or oppose the enemy's advance. A very shallow trench, with the earth thrown to the front, so as to afford shel-

ter to one man lying in it, may be made in somewhat less than half an hour; more elaborate forms in about one hour. So that by placing a man at every 4 ft., active troops can make good shelter for themselves in an hour. To impede the enemy's advance an abattis of felled trees may be used, also wire entanglements.

Fort Madison, Lee co., Iowa, on the Mississippi River, 19 mi. s.w. of Burlington. The town is the seat of paper mills, lumber mills, farming implement works, locomotive works, car shops, rolling mills, boot and shoe factories, etc. Railroads: A. T. & S. F.; St. L. K. & N. W.; and F. M. & D. Pop. 1900, 9,278.

Fort Payne, DeKalb co., Ala., 50 mi. s. of Chattanooga. Surrounding country agricultural and mineral. Railroad, Alabama Great Northern. Industries: fire brick plant, furnaces, and steel mills, stove foundry, coke ovens, saw and planing mills, basket factory, pottery plant, and hardware. The town was first settled in 1876. Pop. 1900, 1,037.

Fort Scott, Bourbon co., Kan. Railroads: Kansas City; Ft. Scott & Memphis; Missouri Pacific; M. K. & T.; and others. It is in the midst of a country rich in bituminous coal. There are also extensive flagstone quarries and cement deposits in the vicinity. Ten lines of railway touch there. It has ten miles of street railway. There is a high school and a normal college, the latter having 700 students. The principal manufactures are flour, soap, woolen goods, carriages, sorghum and beet sugar, etc. Pop. 1900, 10,322.

Fort Smith, Sebastian co., Ark., on Arkansas River, 169 mi. w.n.w. of Little Rock. Railroads: St. L. Iron Mt. & S'thrn.; St. L. & San F.; term. of Little Rock & Fort Smith. Here are cigar, ice and furniture factories; also saw mills, cotton gins, cotton seed oil mills etc. Pop. 1900, 11,587.

Fort Sumter (named after Thomas Sumter, a partisan leader in the Revolutionary War), a fort on the entrance to Charleston Harbor, South Carolina, U. S. When South Carolina seceded in December, 1860, Major Anderson, who commanded the defenses in the harbor, abandoned the other forts and occupied Fort Sumter, with a garrison of eighty men, and sixty-two guns. On April 12, 1861, General Beauregard opened fire on the fort which surrendered on the 14th of the same month. The news that Fort Sumter had been fired on spread like wild fire and immediately the whole North was up in arms. Thus was the war opened, The fort repulsed an attack of nine ironclads on April 7, 1863, and was heavily bombarded in August of the same year, but maintained its defense till the final evacuation of Charleston, Feb. 18, 1865, and, on April 14, 1865, exactly four years after its surrender, the U. S. flag was again raised over the fort. Soon after, Richmond was evacuated and the Confederates surrendered. It has been rebuilt on a modified plan.

Fortu'na, the Roman goddess of success, corresponding to the Greek *Tychē.* She is generally delineated with a rudder, emblem of her guiding power; or, later, with a bandage over her eyes and a scepter in her hand, and sitting or standing on a wheel or globe.

Fortuna'tus, the hero of an old popular legend. He obtained a wishing cap and inexhaustible purse of gold, which finally ruined him and his sons. The first printed edition of the story appeared in Germany in 1509, but in various forms it has appeared in most of the languages of Europe.

Fort Wayne, Allen co., Ind., on the Maumee River, and the Wabash & Erie Canal, 148 mi. e.s.e. of Chicago. Railroads: N. Y. C. & St. L.; P. F. W. & C. It has large railroad workshops, walnut lumber factory, wheel works, stove and bolt factory, foundries, and machine shops, organ factory, and woolen mills, and many other industries. The surrounding district is agricultural. There are also forests of hardwood timber which give a large yield. Fort Wayne is the seat of Concord College and Fort Wayne College. Pop. 1900, 45,115.

Fort Worth, Tarrant co., Tex., on the West, Clear, and Trinity rivers, in the northern part of the state, 175 mi. n. of Austin. It is the second city in importance in the state, Dallas being first. Railroads: M. K. & T.; Texas Pacific; St. Louis Southwest; and six others. The city has fine waterworks, and a street car system. It is the seat of Fort Worth University, and a Roman Catholic academy. Industries: flour, cotton, woolen goods, and leather manufactories, rolling mills, iron foundries, jute factory, woven wire factory, stock yards, and pork packing establishment. The surrounding country is agricultural, producing principally cotton, wheat, and corn. Pop. 1900, 26,688.

Forum, among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, by far the most celebrated being the great Roman Forum, between Mount Palatine and the Capitoline Hill. This place, once adorned with the most beautiful statues and buildings, had become almost a waste known as the *Campo Vaccino*, or cattle field, but of late years the government has made clearances and excavations, and taken charge of the valuable relics which are still left. In legal phrase *forum* signifies the court or place where an action is instituted.

Fos'colo, Ugo (1776-1827), an Italian poet and prose writer, educated at the University of Padua. Before the age of twenty he produced his tragedy *Il Tieste* (*Thyestes*), which was received with applause. His best-known works are: *Ultime Lettere de Jacopo Ortis* (*Last Letters of Jacopo Ortis*); *I Sepolcri; Trajedies; Ajax; Ricciarda; Critical Writings; Essays on Petrarch and Discourses on the Texts of Dante.*

Foss (or Fosse), in fortification, a trench or ditch, often full of water, below the rampart of a fortified place, or a post that is to be defended. See *Fortification.*

Fosse Way (or Fosse Road), one of the great Roman roads from Cornwall by Bath, Coventry, and Leicester, to Lincoln. It is still traceable nearly all the way.

Fossil, a term for the petrified forms of plants and animals which occur in the strata that compose the surface of our globe. Most of these fossil species, many of the genera, and some of the families, are extinct. When these remains are only partially fossilized, and occur in superficial or recent deposits, the term *subfossil* is employed.

Foster, JOHN (1770–1843), English essayest, was b. in Yorkshire. In 1805 he published four essays, very celebrated in their time, which established his fame as an author. In 1819 the celebrated *Essay on the Evils of Popular Ignorance* appeared.

Fostoria, Seneca co., O. Railroads: B. & O.; Lake E. & West.; and three others. Is the center of a rich agricultural district; has gas wells of great value; manufactures include glass, flour, machinery, barrels, lumber, etc. Pop. 1900, 7,730.

Foucault (fö-kō), JEAN BERNARD LEON (1819-1868), a French physicist. His name is especially connected with a celebrated pendulum experiment employed as a method of showing the rotation of the earth on its axis, by observing a vibrating pendulum. He also rendered services to optics, electric lighting, photography, etc.

Fouché (fö-shā), JOSEPH, duke of Otranto, (1763–1820), a minister of Napoleon I. He became an advocate and was elected a member of the National Convention in 1792. Here he voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. On the fall of Robespierre (1794), Fouché, who had for some time tended towards the moderate party, managed to make friends with Barras, and was rewarded for his betrayal by the ambassadorship to Milan. He was afterward appointed ambassador to Holland, but ultimately recalled to Paris and made minister of police. Here his peculiar talents had full scope; and although he was twice dismissed by Napoleon, who did not altogether trust him, he always recovered his post, was loaded with riches, and made duke of Otranto. He was minister of police at Napoleon's final abdication and played an important part in the arrangements.

Fougasse (fö-gȧs′), milit. a little mine in the form of a well, 8 or 10 ft. wide and 10 or 12 deep, dug under some work, fortification, or post, charged with powder, or powder and shells, and covered with stones or earth, for destroying the works by explosion.

Fougeres (fö-zhār), a town n.e. France, dep. Ille-et-Vilaine, on a height 28 mi. n.e. of Rennes. It was once fortified, so as to be considered one of the keys of Brittany, but is now open, well built, and has manufactures of flannels, sailcloth, sacking, etc. Pop. 15,578.

Foulis (fou′lis), ROBERT (1707–1771) and ANDREW (1712-1781), two eminent printers of Glasgow. Both were well educated at Glasgow University. In 1739 Robert commenced business as a bookseller, and having obtained the appointment of printer to the university began to issue editions of the ancient classics, which became famous for their accuracy and beauty.

Foundation stone, a stone of a public building laid in public with some ceremony. It has no necessary connection with the foundation of the building.

Foundling Hospitals, institutions for receiving children abandoned by their parents and found by strangers. Among such institutions are that of Paris, instituted in 1670, and that of London in 1739. The latter was originally a hospital for all exposed children; but the enormous increase in abandonments caused the hospital to be changed in 1760 to one for poor, illegitimate children whose mothers are known. The objection that foundling hospitals contribute to the corruption of morals is the strongest which can be urged against such institutions, and is not easily answered.

Fount (or Font), among printers, etc., a quantity of types, in proportions sorted for use, that includes ordinary letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, etc.; as a font of pica, bourgeois, etc. A fount of 100,000 characters, which is a common fount, would contain 5,000 types of *a*, 3,000 of *c*, 11,000 of *e*, 6,000 of *i*, 3,000 of *m*, and about 30 or 40 of *k*, *x*, *y*, and *z*. But this is only to be understood of the ordinary types, capitals having other proportions, which we need not here enumerate.

Fountain (or Artificial Fountain), a contrivance by which water is made to spout from an artificial channel, and often to rise up to a great height in a jet or jets. There are various kinds of artificial fountains, but in those of an ornamental character the water is usually made to rise in a jet by the pressure or weight of a head of water situated some distance above the orifice of issue, in which case the water will rise nearly to the same height as the head. In some cities the public fountains form a feature on the streets. Rome, in particular, is noted for its fountains. At Paris, also, the fountains of the Place de la Concorde, the Tuileries, and at Versailles, are splendid structures.

Fountain, ELECTRIC, is a fountain in which the jets of water are illuminated by means of an electric light, either arc or incandescent or both. By the use of colored screens, beautiful colored effects are secured. The electric light is generally placed under the basin, in such a position that the beam of light, focused by means of a lens, is directed upward into the jet of water. The shaft of light thus illuminates the water, and through the colored screens, give it color. Sometimes the screens are placed in front of the lens by hand. In more elaborate electric fountains, the colored effects are secured by mechanism which enables one man, stationed above ground, to change the lens so as to obtain a variegated effect. The light is sent up from an opening near the base of the jet. By a combination of jets, sprays, and lights, elaborate color effects can be secured.

Fouqué (fö-kā), FRIEDRICH HEINRICH KARL, Baron de la Motte (1777–1843), a German poet and novelist. As a writer his work is marked by fantastic unreality and extravagance of

conception. Several of his tales, *Der Zauberring* (*Magic Ring*), *Undine*, and *Aslauga's Ritter* (*Aslauga's Knight*), have been very popular. A translation of the latter was made by Carlyle.

Fouquier-Tinville (fö-ki-ā-tan-vēl), ANTOINE QUENTIN (1747–1795), notorious for his ferocious cruelty in the first French Revolution. He was an attorney by profession, and having attracted the attention of Robespierre, was appointed public accuser before the revolutionary tribunal. His thirst for blood seems to have been increased by gratification, until it became a real insanity. He proposed the execution of Robespierre and all the members of the revolutionary tribunal in 1794, but was himself arrested, and died under the guillotine, in a cowardly manner.

Fourier (fö-ri-ā), FRANCOIS MARIE CHARLES (1772–1837), a French socialist and founder of the system named after him. He studied in the college of his native town, and subsequently at Rouen and Lyons, occupied subordinate situations in mercantile houses. In the last-mentioned town he entered into business on his own account, but lost all his money from the tumults of war, and was forced to enlist in the revolutionary army. Discharged in 1795 on account of ill-health he returned to commerce, filling quite subordinate situations. He wrote his books in his leisure hours, and published them out of his scanty savings. In his social system Fourier holds that the operations should be carried on by *Phalansteries*, or associations of 1,800 members combining their labor on a district of about a square league in extent, under the control of governors elected by each community. The remainder of the produce is shared in certain proportions to be previously determined among the three elements, labor, capital, and talent. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupied in the several groups of laborers to which he or she belongs, these grades being in every case conferred by the voice of his or her companion.

Fourier, JEAN BAPTISTE JOSEPH (1768–1830), a French mathematician, was educated in the military school there, and after holding an appointment for a short time in the Polytechnic School followed Bonaparte to Egypt. Among his principal works are the *Théorie Analytique de la Chaleur* (1822), and *Analyse des Equations Determinées*, published in 1831 after his death.

Foveaux Strait (fō'vō), the strait between the South Island of New Zealand and Stewart's Island.

Fowl, a word originally synonymous with *bird*, now used in a stricter sense to designate the birds of the genus *Gallus*, of which the common domestic fowl (cock and hen) is a familiar example. The general form and characters of the bill, feet, etc., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles—characters which are most conspicuous in the males. The legs of the male are furnished with spurs which are much used in conflict, the cocks being very pugnacious and unable to suffer the presence of a rival. In the center of the cock's tail are two long feathers, which fall backward in a graceful arch and add great beauty to the whole aspect of the fowl. Except in the pure white breeds the plumage of the cock is always more splendid than that of the hen. All the species are natives of the East Indies and the Malayan Archipelago. Some have thought that the *Bankiva Jungle Fowl*, a native of Java, is the original stock of the domesticated poultry. Among well-known varieties are the *Cochin-China Fowl* the *Game Fowl*, the *Dorking*, the *Spanish Fowl*, and the *Bantam*.

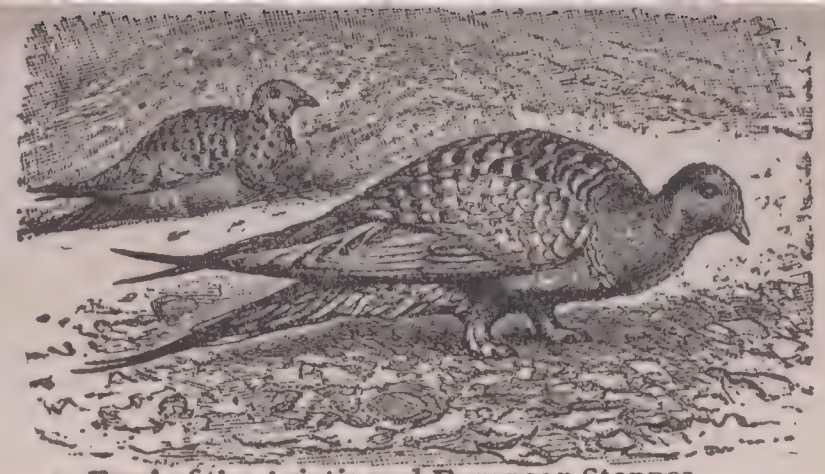
Fox, an animal closely allied to the dog, with a straight, bushy tail, elongated pupils, and erect ears. Foxes are natives of almost every quarter of the globe, and are everywhere among the most sagacious and wily of all beasts of prey, very voracious, devouring birds and small quadrupeds, and committing ravages not only on animals, but on fruits, honey, eggs, etc. The common fox of Europe and Asia is well known. Among other species are the Arctic fox, celebrated for its glossy white winter fur; the *black fox*, similar to the common fox, but distinguishable by its rich, shining black fur, a native of the northern parts of Asia and America; the *gray fox* has a thick tail containing at its tip a tuft of stiff hairs, common through the northern parts of America; the *red fox* of America, generally of a pale yellow hue; the *crossed fox*, fur a sort of gray, muzzle and lower parts of the body black, a dark cross on the shoulders; the *swift fox*, an inhabitant of the plains which lie at the base of the Rocky Mountains.

Fox, CHARLES JAMES (1749–1806), an eminent English statesman, the second son of Henry, first Lord Holland. In 1780 he was

Common Fox.

elected member of Westminster, and on the defeat of the administration of Lord North, and the accession of that of the Marquis of Rockingham, he obtained the office of secretary of state for foreign affairs 1782. He was a close friend of Burke and a great rival of Pitt, and played a most important part in government affairs until his death. As a powerful and purely argumentative orator he was

1. Pterocles. Fowl with long sharply pointed Tail.



2. Fowl of the Asiatic and European Steppes. (Syrrhaptes parodoxus).

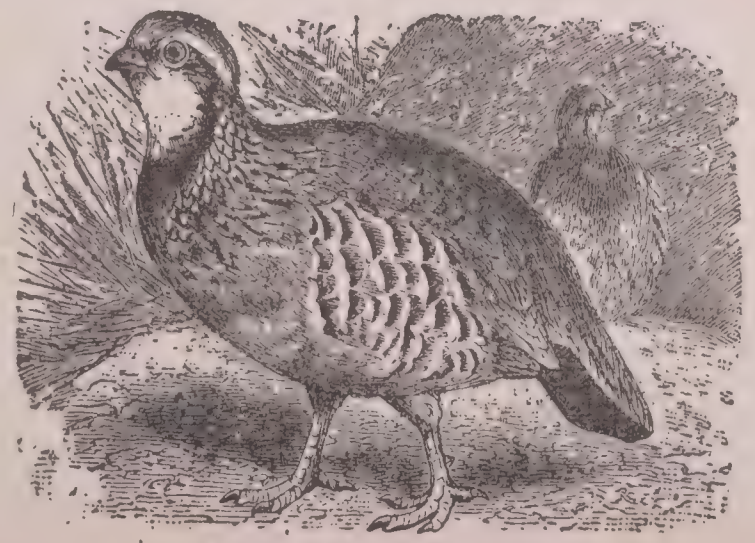
3. White Grouse.

4. Common Quail.

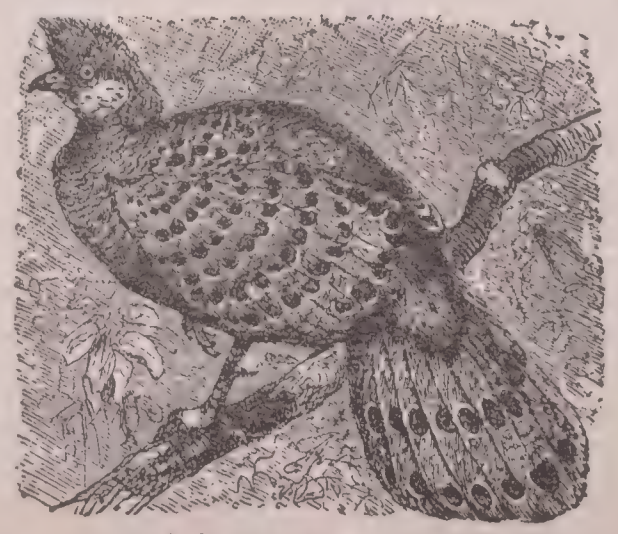
5. Gray Partridge.

6. Tuft Quail.

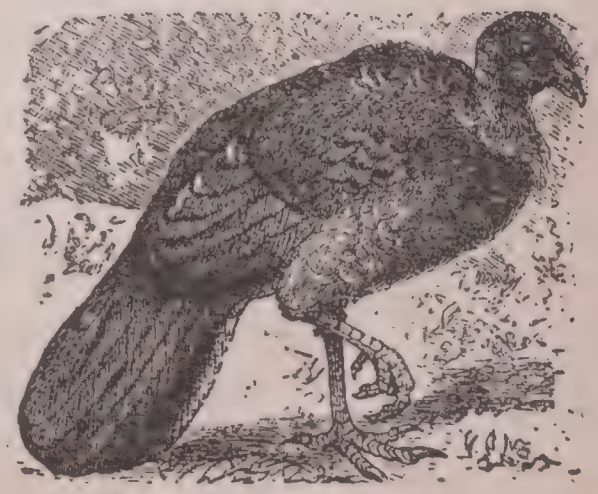
7. Common Currason of Mexico, a Croaking Fowl.



8. Caccabis, a red Fowl.



9. Oriental Pheasant.



10. Talegalla, Brush Turkey.

1. Common Curlew.

2. Porphyrio, species of Fowl of southern Europe and the Tropics.

3. Large Bittern.

4. Fallow Finch.

5. Brown Stork.

6. Shoebill, African Wader.

7. Swordbill, a Plover.

of the very first class; although as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, although highly forcible.

Fox, GEORGE (1624–1691), the founder of the Society of Friends, or Quakers, was b. at Drayton, in Leicestershire, his father being a weaver. At Derby his followers were first denominated *Quakers*, in consequence of their trembling mode of delivery, and calls on the magistracy to tremble before the Lord.

Fox Bats (or Flying Foxes), a name given to the fruit-eating bats of the family Pteropidæ, including some of the largest of the bat tribe, one species attaining a length of from 4 to 5 ft. from the tip of one wing to the tip of the other. They inhabit Australia, Java, Sumatra, Borneo, etc., as well as the continents of Asia and Africa.

Common Foxglove.

Fox, JOHN (1517–1587), an English church historian. His principal work is the *History of the Acts and Monuments of the Church*, commonly called *Fox's Book of Martyrs*, first printed in 1563, in one vol. folio.

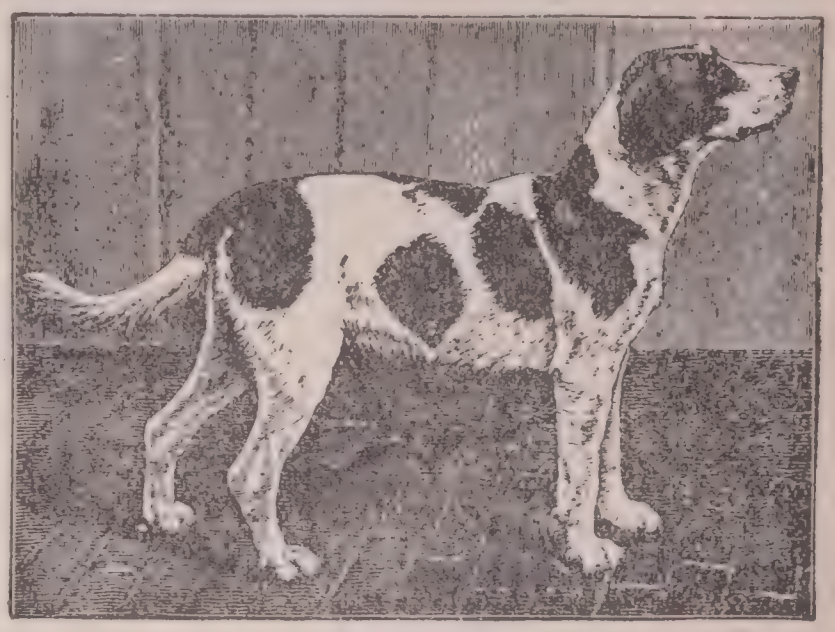
Fox'glove, a plant which grows on banks, pastures, etc., in hilly and rocky countries in Europe, Asia, and the Canary Islands. It is one of the most stately and beautiful of the herbaceous plants, and one that has great reputation as a medicinal plant, being employed as a sedative, narcotic, and diuretic in diseases of the heart and in dropsy. Its medicinal properties are due to the poisonous substance known as digitalin. A decoction or infusion of the leaves is what is generally used. The flowers are usually purple, but sometimes white.

Foxhound, a hound for chasing foxes, a variety of hound in which are combined, in the highest degree of excellence, fleetness, strength, spirit, fine scent, perseverance, and subordination. The foxhound is smaller than the staghound, its average height being from 20 to 22 in. It is supposed to be a mixed breed between the staghound or the bloodhound and the greyhound. It is commonly of a white color with patches of black and tan.

Fox Indians, a tribe of North American Indians belonging to the Algonquin family, now

few in numbers and scattered over the Indian Territory, Iowa, Kansas, and Nebraska.

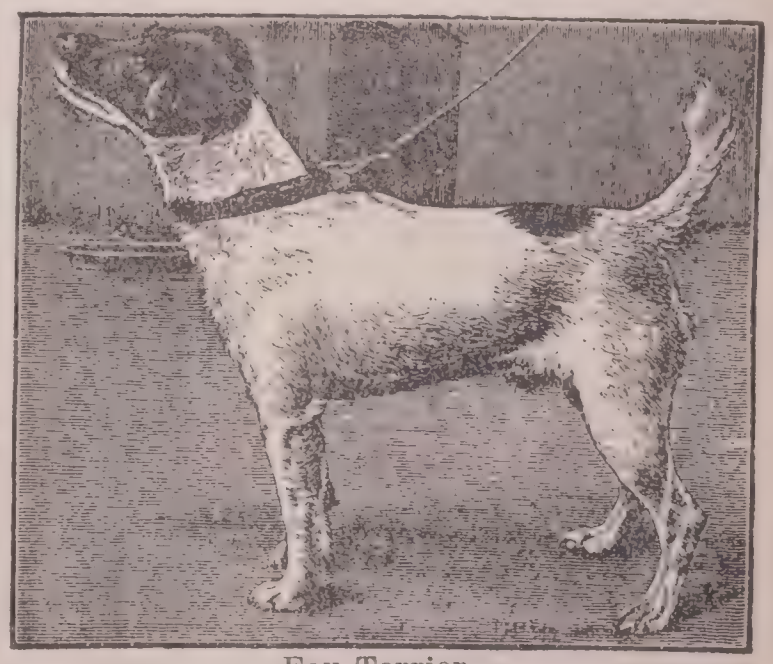
Fox River, a river of Wisconsin, which enters Green Bay, an arm of Lake Michigan, after passing through Lake Winnebago. It is connected by canal with the river Mississippi, and thus furnishes water communication between that river and the Atlantic.



Foxhound.

Foxtail Grass, the common name given to grasses because of the close cylindrical panicle in which the spikelets of flowers are arranged, having somewhat the shape of a fox's tail. It is an abundant natural grass in meadows and pastures, and is an excellent fodder plant. It is the most grateful of all grasses to cattle, and possesses all the requisites of a good grass. The alpine foxtail grass is a rare plant, being much prized as a botanical rarity.

Fox Terrier.—The origin of the fox terrier is somewhat obscure. From the earliest days of hunting a small dog has been used to follow the fox to its earth, but it is difficult to say



Fox Terrier.

when this dog became identical with the modern fox terrier. The chief points of the fox terrier are: head, long, flat, rather narrow, but with powerful jaws and teeth; ears, small, V-shaped, and drooping forward; nose, black; eyes, small; back, short and strong; tail, gen-

erally cut short, set on high, carried gayly; fore legs—an important point—must be straight, showing no ankle, good bone; hind legs, rather straight, with long and powerful thighs; feet, round, with arched toes; color, white with black or tan markings—a point of little importance; weight, not more than 17 lbs; coat, in the smooth variety, short, hard, and dense; in the rough variety it should be half an inch long, but without any silkiness. The expression of the fox terrier should be keen and hard, full of life and fire. Though the fox terrier should not be quarrelsome, he should be ready to face anything in the way of his legitimate work. He is unequaled as a companion.

Foyle, a river of Ireland, which flows northeast through Tyrone, Donegal, and Londonderry till it falls into Lough Foyle 4 mi. below the city of Londonderry. It is navigable up to Londonderry for vessels of 800 tons.

Fraction, in arithmetic and algebra, a combination of numbers representing one or more parts of a unit or integer. Fractions are divided into *vulgar* and *decimal.* Vulgar fractions are expressed by two numbers, one above another, with a line between them, and may be either simple, complex, or compound. The lower, the *denominator*, indicates into how many equal parts the unit is divided; and the number above the line, called the *numerator*, indicates how many of such parts are taken. A decimal fraction consists of all the figures to the right of the decimal point, as, .138, .295.

Franc, a modern French silver coin, and money of account which since 1795 has formed the unit of the French monetary system, and has also been adopted as the unit of currency by Switzerland and Belgium. It is of the value of a little over 19 cents, and is divided into 100 centimes.

France (anciently *Gallia*), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states. It is bounded n. by the Straits of Dover and the English Channel; w. by the Atlantic Bay of Biscay; s. by Spain and the Mediterranean Sea; e. and n.e. by Italy, Switzerland, Germany, and Belgium. Its greatest length from n. to s. is 600 mi., and its greatest breadth 547 mi. The coast line on the whole is considerably diversified by bays, estuaries, and indentations of various kinds, and presents numerous good harbors. It is studded by a number of islands, especially in the northwest and west, the largest being Oléron, Ré, and Belle Isle. The total area (including Corsica) is 204,092 sq. mi. The capital is Paris; the other large towns in order of population are Lyons, Marseilles, Bordeaux, Lille, Toulouse, Nantes, St. Etienne, Havre.

Mountains.—The interior is traversed from southwest to northeast by successive chains of mountains, commencing with the Pyrenees and including the Cevennes, the Côte d'Or, the Vosges, and others, forming the watershed, on one side of which the rivers flow w. and n. into the Atlantic and the English Channel, on the other side e. and s. into the Mediterranean. At its northeastern extremity this system is

met by the Alps and the Jura. Mount Blanc itself (15,781 ft.) is mostly within the French boundary line. Some lofty Pyrenean peaks are also within French territory, the highest being Vignemale (10,792 ft.). Near the center of France, and separate from the great watershed of the country, are several groups of volcanic mountains known by the general name of the mountains of Auvergne, the chief peaks of which are the Plomb du Cantal (5,983 ft.), the Puy de Sancy (6,100 ft.), and the Puy de Dôme.

Rivers.—The spurs thrown off by the great watershed divide France into seven principal river basins, six of which are on the northwestern slope and one on the southeastern. These are: 1, The basin of the Garonne and its affluents. 2, The basin of the Loire and its tributaries (Nièvre and Maine on the right, the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). 3, The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right, the Yonne and Eure on the left). 4, The basin of the Meuse with its affluent the Sambre. 5, The basin of the Escaut, or Scheldt, with its affluent the Scarpe. 6, The basin which pours a number of tributaries, the principal of which is the Moselle, into the Rhine. 7, The basin of the Rhone, occupying the whole of the territory which lies to the southeast of the great watershed, the tributaries being the Ain, the Saône, Ardèche, and Gard on the right, and the Isère, Drôme, and Durance on the left. The four great rivers of France are the Loire, Seine, Rhone, and Garonne. France has in all more than 200 navigable streams, with a total navigation of about 6,000 mi. Lakes are few, and individually very limited in extent.

Geology.—Among geological formations granite holds a chief place as forming the nucleus of the mountains generally, and being the prevailing rock in the Alps, the Pyrenees, the Cevennes, and in the northwest peninsular portion of the country (Brittany). The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still visible in extinct craters and lava streams. In the Jura, limestome occurs in such enormous masses as to have given its name to a peculiar formation (the Jurassic). The secondary formation, commencing with this limestone, is largely developed in many parts, and furnishes a considerable number of coal and mineral fields. The tertiary formation covers a vast extent of surface, particularly in the southwest and around Paris.

Climate.—Lying almost wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°, France has a climate not inferior to that of any country of Europe. In the south, and particularly the southeast, which is the warmest, the olive is successfully cultivated. Further north to a limit determined by a line drawn diagonally in an e. n. e. direction from

the department of Gironde to that of the Vosges, the cultivation of maize or Indian corn extends. More northward still, a line drawn from the mouth of the Loire to Mezières in the Ardennes department marks the extreme limit of the profitable culture of the vine. Beyond this line is the fourth and coldest region. All these regions, notwithstanding their diversities of temperature, are generally healthy, and have an atmosphere remarkable for salubrity, serenity, and brightness.

Agriculture, etc.—About nine tenths of the soil of France is productive, and about one half of the whole is under the plow. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are meslin, or mixed corn, potatoes, hemp, rape, maize, buckwheat, flax, and beet. Beet is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. In France the grass is on a much more limited scale than the arable husbandry, and the breeding of cattle is indifferently practised. The rearing of sheep is more successful, much of the wool being scarcely inferior to merino wool. Excellent horses are bred in the north, and as there is an extensive demand for horses for the army, considerable pains is taken in the government studs to improve the breeds. Asses and mules, generally of a superior description, are much employed. The cultivation of the vine is one of the most important branches of French agriculture, the total quantity of land in vineyards being nearly a twenty-fifth of the whole surface. In everything relating to this branch of culture the French are unsurpassed, the various first-class wines which they produce under the names of Champagne, Burgundy, Bordeaux, etc., being universally known. It is estimated that in good years France produces about one half of the whole wine production of the world. Since about 1870 the vineyards have suffered greatly from the devastations of the *Phylloxera*. Among the most important fruit trees cultivated in France are the apple, from the fruit of which much cider is made, especially in Normandy; the chestnut, which in some of the central districts of France is a staple of food among the poorer classes; the mulberry tree, cultivated in the southeast both for its fruit and its leaves, the latter furnishing the food of the silkworms so largely reared here; the olive also in the southeast; the pear, plum, peach, orange, citron, fig, etc. The forests occupy about one seventh of the whole territory.

Minerals.—Coal fields are numerous, but only two are really of importance—that of Valenciennes in the n.e. forming the western extremity of the great Belgian coal field, and that of St. Etienne in the s.e., to which the manufactures of that town, Lyons, and the surrounding districts, are indebted for much of their prosperity. The annual output falls so far short of the annual consumption, that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal fields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast furnaces; but of the total amount of ore smelted in the country a considerable proportion is imported. Other metals, such as lead, zinc, manganese, copper, etc., are obtained to some extent. Common salt is obtained from mines of rock salt, from salt springs, and in still greater quantity from lagoons and salt marshes on the coast.

Manufactures.—The most important of the textile manufactures is that of silk goods, having its chief seat at Lyons and the surrounding districts. It employs about two millions of persons, and furnishes about 27 per cent. in value of the whole of the manufactured products of France. After silk goods, though at a considerable distance, follow cotton stuffs and woolens, made largely at Rheims, Amiens, and Beauvais; carpets at Abbeville; tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace at St. Quentin, etc.; cutlery, porcelain, stoneware, and common pottery, beet-root sugar, leather, paper, hats, hosiery, steel, iron, brass, and zinc ware, plate and flint glass, etc., besides many ornamental and artistic articles; jewelry, clocks, surgical instruments, types, engravings, etc., which have their common seat in the capital. The fisheries of France are important. Among the principal is that of sardines on the coast of the Bay of Biscay; that of herring, mackerel, turbot, salmon, etc., in the English Channel and the North Sea; that of tunnies and anchovies on the coasts of the Mediterranean. Oyster breeding is largely engaged in, the most extensive oyster-beds being those of the basin of Arcachon in the department of the Gironde. Cod fishing is carried on actively near the Newfoundland banks by French fishermen, and also near Iceland.

Commerce.—The principal towns from which the internal commerce emanates are Paris, Lyons, Rouen, Lille, St. Etienne, Toulouse, Nîmes, Nancy, Perpignan, etc. In 1887 the imports for home consumption amounted to $805,000,000; the exports of native products and manufactures to $650,000,000. The shipping of France is much below what might be expected from the development of its foreign commerce, considerably more than one half of which is carried by foreign vessels. In 1888 the merchant navy of France included 14,253 sailing vessels of 2 tons and upward, with a total tonnage of 465,873, and 984 steamers of 506,652 tons. The chief seaports are Marseilles, Havre, Bordeaux, Rouen, Nantes (including St. Nazaire), Dunkirk, Calais, Boulogne, Dieppe.

Canals, Railways, etc.—The canals are numerous. The Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an e. s. e. direction into the lagoon of Thau, and thereby gives a continuous navigable communication between

the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassonne, and Narbonne. In like manner three separate canals cut across the basin of the Rhone; the Canal du Centre, or of Charollais, connecting the Saône and the Loire; the Rhone and Rhine Canal, so called from uniting these two rivers, partly by the intervention of the Doubs; and the Canal of Bourgogne, connecting the Saône, Yonne, and Seine. In all France possesses about 3,000 mi. of canals in addition to about 5,000 mi. of navigable rivers, giving a total equal to about 1 mi. of internal navigation for every 25 sq. mi. of surface. The railways in France partly belong to the state, and partly have been granted to private companies for a limited period, at the end of which they become state property. In 1888 there were 20,000 mi. of railway in operation. The total length of telegraph lines is 55,000 mi.

Administration of Justice.—In accordance with the general arrangement which divides the whole country into departments, each department into arrondissements, each arrondissement into cantons, and each canton into communes, there is a series of courts, commencing with the justice of peace of each commune, who judges in petty causes, but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. Failing such arrangement the complainant brings his action before the court of first resort, there being one such in every arrondissement, besides a *tribunal de commerce* to which mercantile and commercial causes are appropriated. From these courts an appeal lies to the courts of appeal of which there are twenty-seven, each having jurisdiction over several departments. The most important commercial and manufacturing towns have also commercial courts, the members of which are elected by the chief business men of the respective places. Above all these courts, and properly the only supreme court of the state, is the *cour de cassation*, which has the power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Education and Religion.—In France the superintendence of education in all its branches is expressly committed to a high functionary, who takes the name of minister of public instruction and fine arts, and is assisted by an educational council. The highest educational institutions are either special institutions, such as the Museum of Natural History, the Collége de France, the Polytechnic school; or are a sort of university colleges known as "faculties," each of which is specially devoted to literature, law, medicine, theology, etc. Several of these are usually grouped together to form one *académie*, there being fifteen academies in all. At these establishments the education given is of the highest description, and need not be particularized. Secondary instruction, either classical or commercial and industrial, is given by the state in the lyceums, by the communes in the communal colleges, or in certain other seminaries. There are about 90 lyceums, generally situated in the capitals of the departments, and over 250 colleges. Primary instruction is given in the communal schools, being compulsory and free. Religion, in like manner, is taken under the cognizance of the state, and falls within the province of the minister of justice and religion. The state declares that the Roman Catholic is the religion of the majority, but does not establish it; on the contrary, it places all forms of religion which have more than 100,000 adherents, and are not obviously subversive of social order, on an equal footing, and professes to deal impartially with all by paying salaries to their ministers.

Army and Navy.—By law, military service is declared to be obligatory upon every Frenchman who is not pronounced unfit for military service. They have to serve first in the regular army for 3 years, then in the reserve of the regular army for 6 years, next in the territorial army for 6 years, and finally in the reserve of the territorial army for 10 years. This gives France on a peace footing an army of more than half a million, which on a war footing may be brought up to two and a half million or even more. The French navy is manned partly by conscription and partly by voluntary enrollment. In 1891 the effective war navy of France included 32 heavy fighting vessels; there were likewise building 11 others; 11 more were for coast service, besides other ironclads still on the stocks.

Finance.—France has now a larger revenue, expenditure, and public debt than any other country in the world. The estimated gross revenue for 1892 was francs, 3,780,077,692, about $756,015,538, the expenditure being estimated at somewhat less. The consolidated debt amounts to about $4,250,000,000, while the total national debt is at least about $6,446,000,000. The chief items of revenue are excise and customs, registration, stamps, posts and telegraphs, and other state monopolies, land tax, licenses, etc.

Constitution.—France has been a republic since the overthrow of the second empire by a Paris mob on Sept. 4, 1870. The details of the constitution were fixed by a law passed by a national assembly which met in 1871 (some revision having been made since). This law places the legislative authority in the hands of an assembly composed of two chambers, the Chamber of Deputies and the Senate. The Chamber of Deputies is elected by universal suffrage, each department forming one electoral district and a member being appointed for every 70,000 inhabitants. The total number is 584, 6 being for Algeria and 10 for the colonies. The deputies are elected for 4 years. The Senate consists of 300 members, of whom 75 were originally elected for life; but in 1884 it was enacted that vacancies among the life senatorships should be filled up as they arose by the election of ordinary nine-year senators. Both senators and deputies are paid. The head of the government is a president, elected

for 7 years by a majority of votes of the members of the two chambers sitting as one. The president is assisted by a body of ministers appointed by him. He has the appointment to all civil and military posts.

Weights, Measures, and Money.—The unit of the French monetary system is the franc (of the value of about 20 cents), which is divided decimally. The system of weights and measures is also decimal, the units with their English equivalents being as follows: the mètre =39.37 in. or 3.28 ft.; the kilomètre, or 1,000 mètres=1,093.6 yds. or .621 of a mi.; the are, the sq. of 10 mètres=1,076.441 sq. ft.; the hectare or 100 ares = 2.47 acres; the sq. kilomètre=.386 of a sq. mi.; the stère or cubic mètre=35.317 cubic ft.; the litre=1.76 pts.; the hectolitre or hundred litres=22.0097 gal.; the gramme=15.4323 gr.; the kilogramme or 1,000 grammes=2.205 lbs.

Political Divisions and Extent of Empire.—Before the Revolution of 1789 France was divided into general governments or provinces, the number of which varied at different epochs. At the Revolution the whole of France, including Corsica, was parceled out into departments, and each department subdivided successively into arrondissements, cantons, and communes. The number of departments was originally eighty-three, but it has been at different times increased and decreased. There are now eighty-seven departments, the last formed being Haut-Rhin (Belfort). The average area of each is about 2,300 sq. mi. The most recently acquired territories were Nice and Savoie. By the Franco-German War of 1870–71 nearly all Alsace and part of Lorraine were lost. In addition to the territory it occupies in Europe, France possesses (either absolutely or as protected territories) Algeria, Tunis, Senegambia, and other territories in West Africa, a large area of the Congo region, Réunion, and other East African islands; Cochin-China, Tonquin, Anam, and smaller possessions in Asia; French Guiana in South America, with the islands of Guadeloupe, Martinique, etc.; New Caledonia, Tahiti, etc., in the Pacific. The total French dominions are thus as follows: France, 204,092 sq. mi.; Asiatic possessions, 202,881 sq. mi.; African, 941,222 sq. mi.; American, 48,059 sq. mi.; Oceanic, 9,112 sq. mi.; total, 1,405,366 sq. mi.

History.—France, or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by a number of independent tribes, who appear to have been mainly Celtic in race. In the latter half of the second century B.C. the Romans conquered a portion of the southeast, and under Julius Cæsar the conquest of all Gaul was completed between 58 and 51 B. C. Subsequently the country became completely Romanized in language, civilization, and religion, and many flourishing towns sprang up. In the decline of the Roman Empire German tribes began to make settlements in Gaul, and it was from a body of these, known as *Franks*, that the name France arose. Toward the end of the fifth century Clovis, chief of the Salian

Franks, made himself master not only of almost all France (or Gaul), but also of a considerable territory east of the Rhine. The dynasty which he founded was called the Merovingian from his grandfather Merovæus. Clovis died in 511, leaving his kingdom to be divided among his four sons as subsequent rulers often did. The Frankish dominions were thus differently divided at different times; but two divisions, a western and an eastern, or Neustria and Austrasia, became the most important. A large part of the history of the Franks under the Merovingian kings is the history of the contests between these two states. Latterly Pippin, or Pépin d'Héristal, mayor of the palace of the Austrasian king, conquered Neustria and made his sway supreme throughout the kingdom of the Franks. This date may be regarded as that of the real termination of the Merovingian line, for although kings belonging to this family continued to be crowned till 752, they were mere puppets. Pépin d. in 714. He was succeeded by Charles Martel (714–741), succeeded by Carloman in Austrasia and Pépin the Short in Neustria and Burgundy. Pépin was king of the Franks (752–768), succeeded by his sons Charles, afterward known as Charlemagne, and Carloman. The latter dying in 771, Charlemagne then became sole ruler, and conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three fourths of Italy, and Spain as far as the Ebro. By Pope Leo III on Christmas day in the year 800 he was crowned in the name of the Roman people as Emperor of the West. There was as yet, strictly speaking, no kingdom of France, and Charlemagne was a German, and his empire a German one.

To Charlemagne succeeded in 814 his youngest son, Louis the Pious. At the death of the latter the empire, after many disputes, was eventually divided by the Treaty of Verdun in 843 among his sons, the portion nearly corresponding to modern France falling to Charles the Bald. From this time the separate history of France properly begins, the history of the French language being also traced to the same period, while the eastern portion of the old Frankish territory remained German. After Charles the Bald, the first of the Carolingian kings, had been succeeded in 877 by Louis II, and Louis II by Louis III (879–882), and Carloman (879–884), Charles the Fat, king of the eastern Frankish territory, became ruler of the western also, till 887, when he was deposed. After a brief usurpation by Eudes, count of Paris, Charles III, the brother of Louis III, was recognized as king. But his kingship was little more than nominal, France being divided into a number of great fiefs, the possessors of which though acknowledging the feudal supremacy of Charles, were practically independent. In these circumstances Charles, unable to offer any adequate resistance to the Norman pirates who were devastating the coast, and making incursions into French ter-

ritory, surrendered to them, in 912, the province which took from them the name of Normandy. Toward the end of his reign Hugh of Paris, as he is generally called, duke of France, was really the most powerful person in the kingdom, and throughout the reigns of Louis IV, Lothaire, and Louis V, he and his son Hugh Capet, held the real power. On the death of Louis V without children in 987 Hugh Capet mounted the throne himself, and thus became the founder of the Capetian dynasty. The great fiefs of Paris and Orleans were thus added to the crown, and Paris became the center of the new monarchy.

The first task of the Capetian line was to reconquer the royal prerogatives from the great vassals, but for two centuries they were unsuccessful. Hugh Capet d. in 996, and his first three successors, Robert (d. 1031), Henry I (d. 1060), and Philip I (d. 1106), effected nothing whatever toward the establishment of the royal authority. Louis VI was more successful, being greatly helped by the fact that the nobility had been much weakened by the Crusades. The growth of the towns also, which ultimately became the allies of the kings, was a powerful check on the nobles.

Louis VI died in 1137, and the throne continued in a regular line of succession until 1328 as follows: Louis VII (d. 1180), Philip Augustus (Philip II) (d. 1223), Louis VIII (d. 1226), Louis IX (St. Louis) Philip III (the Bold) (d. 1285), Philip IV (the Fair) (d. 1314), Louis X (d. 1316), John I (d. 1316: reigned 5 days), Philip V (d. 1322), and Charles IV (d. 1328), with whom the first branch of the Capetian kings became extinct, the Salic law excluding the female succession.

The crown thus fell to Philip of Valois, a cousin, who became king as Philip VI. His claim was disputed by Edward III of England, and the dispute led to a series of wars which were not terminated for more than 120 years, During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI, and after his death over John (II) the Good, who was taken prisoner at Poitiers in 1356, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V) the Wise, who succeeded John the Good in 1364, and his constable, Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI (1380–1422), during which Henry V of England, reviving the claim of Edward III to the French crown, invaded France, won the field of Agincourt, and obtained a treaty (Treaty of Troyes), acknowledging the right of succession to the French crown in himself and his descendants. Charles VI died in 1422, a few weeks after Henry V, whose son, Henry VI, a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431 the peasant girl Joan of Arc animated the French in the cause of the dauphin, who was crowned as Charles VII at Rheims in 1429, and in 1451 the English had lost all their possessions in France, except Calais. The shrewdness and perfidy of Louis XI (1461–83) completed the subjugation of the great barons, and laid the foundation of absolute monarchy. Maine, Anjou, and Provence were left to him by the will of the last count, and a large part of the possessions of the duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII (1483–98), united also Brittany to the crown by his marriage with Anne, the heiress of the fief, and effected a conquest of Naples, which lasted but a short time.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII, who was descended from Louis of Valois, duke of Orleans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. On his death the crown reverted to another branch of the house of Valois, that of Angoulême Francis I (1515–47) being the grandson of John, count of Angoulême, uncle of Louis XII. Francis I still continuing the attempts at conquest in Italy, was brought into conflict with Charles V of Germany, who also claimed Milan as an imperial fief. The result was five wars between France and Germany, in the first of which Francis had to retreat across the Alps; in the second he was taken prisoner at Pavia; in the third he seized Savoy and Piedmont, which the Peace of Crespy (1544), made at the conclusion of the fourth war, allowed him to keep.

Francis I d. in 1547, and his son, Henry II (1547–59), pursuing the same policy, renewed the war for the fifth time with the house of Hapsburg. In the Peace of Cateau-Cambrésis (1559), with which it ended, Henry had to surrender Savoy and Piedmont, but remained in possession of the German bishoprics of Metz, Toul, and Verdun. The year before, Calais, the last English possession in France, had been captured by Francis, duke of Guise. Francis II, the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559–60). The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX (conducted during his minority by the queenmother, Catherine de Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. These continued throughout the reign of Charles IX and his successor, Henry III (1574–89), and were only terminated when Henry IV, orginally king of Navarre, and since

the death of Henry III, king of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

Henry IV was the first French sovereign of the house of Bourbon, which inherited its right to the throne from a son of Louis IX. He united to the crown of France the kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman, establishing religious toleration (Edict of Nantes, 1598), and laboring diligently for the welfare of the state. He was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Henry's son Louis XIII the French policy was at first wavering, until the prime minister, Cardinal Richelieu, gave it a steady direction. He restored the French influence in Italy and the Netherlands, humbled Austria and Spain, and created that domestic government which rendered the government completely absolute.

Louis XIII d. in 1643, the year after his great minister, and was succeeded by Louis XIV, "le Grand Monarque." The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis was declared of age. During his ministry France obtained by the Peace of Westphalia (1648) the German province of Alsace, and by the peace of the Pyrenees (1659) parts of Flanders, Hainaut, Luxembourg, etc. After the death of Mazarin, in 1661, Louis XIV took the government into his own hands, and ruled with an absolute sway. The period which immediately followed was the most brilliant in French history. His ministers, especially Colbert, and his generals, Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; the writers of the period were also among the greatest in French literature. An unsuccessful attempt was made on the Spanish Netherlands; a war was undertaken against Holland, Spain, and Germany, which ended in France receiving Franche Comté and other places from Spain, and Freiburg from Germany. In 1681 Strasbourg was seized from the empire in a time of peace. The last war of Louis was the War of the Spanish Succession (1701–14), which resulted unfortunately for France. During this reign great injury was done to French industry by the revocation of the Edict of Nantes in 1685. Louis XIV d. in 1715, leaving the finances in disorder, and a national debt amounting to no less than 4,500,000,000 livres. Louis XV, the grandson of Louis XIV, succeeded at the age of five years. During his minority the regent, the Duke of Orleans, squandered the revenues in the most reckless manner, and matters went from bad to worse. In 1723 Louis was declared of age, but he sank under the pernicious influences of mistresses like Pompadour and Du Barry into extravagance and license, entering into useless and costly wars (War of Austrian Succession, 1740–48; Seven Years' War, 1756–63), and contracting enormous debts. During this reign two important acquisitions were made by France, namely, Lorraine and Corsica.

With the reign of Louis XVI began the period of expiation for the misdeeds of the French monarchy and aristocracy, which had culminated in the preceding reign. The king himself was amiable, but the whole administration was rotten, and the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The good intentions of Louis were neutralized by a total lack of energy and firmness. The first difficulty of his government, and the rock on which it split, was the hopeless condition of the public finances, with which Turgot, Necker, Calonne, Brienne, and again Necker tried in vain successively to grapple. Finding all ordinary measures unavailing, Necker demanded the convocation of the States General, which had not met since 1614. They met on May 5, 1789, but as the nobles and clergy refused to conduct business so as to give the Third Estate its due weight, the deputies of this body assumed the title of the National Constituent Assembly, and resolved not to separate till they had given a constitution to France. The clergy and nobles then yielded, and the fusion of the three orders was effected on June 27. Foreign troops, however, were brought to Paris to overawe the assembly. The people now demanded arms, which the municipality of Paris supplied; and on July 14 the Bastile was captured and destroyed. Lafayette was made commander of the newly established national guard. On August 4 a decisive step was taken by the abolition of all feudal rights and privileges. On October 5 Versailles was attacked by the mob, and the royal family, virtually prisoners, were taken to Paris by Lafayette. The king tried to obtain the aid of some of the foreign powers against his subjects, and made his escape from Paris June 20, 1791; but he was recognized, arrested at Varennes, and brought back to Paris. On Sept. 30, 1791, the assembly brought its work to a finish by producing a new constitution, which was sworn to by the king on September 14, and he was then reinstated in his functions. This constitution deprived the king of arbitrary powers, provided liberty of worship and freedom of the press, of commerce, of industry; abolished the laws of primogeniture and entail as well as titles; all France was redivided into eighty-three departments, nearly equal in extent.

The Constituent Assembly was, according to the constitution, immediately followed by the Legislative Assembly, which met Oct. 1, 1791, and in which there were two parties of political importance, the Girondists, moderate republicans, so named because their leaders came from the department of the Gironde, who led it, and the Montagnards, extreme radicals, known collectively as the Mountain, because their seats were the highest on the left side of the hall, who subsequently became all-powerful in the convention. The constitutionalists and monarchists were already powerless. The de-

claration of Pilnitz by the emperor of Germany and the king of Prussia, threatening an armed intervention on behalf of the king, compelled the Assembly to take a decisive course, and on April 20, 1792, war was declared against Austria and Prussia. Reverses to the French troops caused a popular rising, and the Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the Assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a National Convention in place of the Assembly. The first act of the Convention was to proclaim a republic. On December 3 the king was cited to appear before it. On Jan. 20, 1793, he was sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, and Spain joined the coalition. The extremists in France only grew more violent, a committee of public safety, with sovereign authority, was appointed April 6, and the Reign of Terror begun. The struggle between the Girondists and the Montagnards, or Jacobins, terminated in favor of the latter. A new constitution was adopted by the Convention on June 23, called the Constitution of the Year 1, the Republican Calendar being adopted by the Convention on Oct. 5 1793, the year 1 beginning on Sept. 22, 1792. Christianity was formally abolished. Risings against the government were put down with frightful bloodshed. Both in Paris and the provinces executions and massacres of persons alleged to be disaffected to the party in power followed each other daily. The queen was executed on Oct. 16, 1793, the Girondists on October 31, and others followed, Robespierre being foremost in the bloody work. At length the Reign of Terror came to an end by the execution of Robespierre and his associates on July 27 and 28, 1794. Danton and Hébert, his old allies, he had already brought to the scaffold. Marat, another man of blood, had perished by assassination. The campaigns of 1793 and 1794 resulted favorably to the French arms, which were carried beyond the French frontier, Belgium, and Holland being occupied, Spain being invaded, and the allies being driven across the Rhine. These successes induced Prussia and Spain to sign the treaties of Basel (1795), recognizing the French Republic. In 1795 the Convention gave the republic a new constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients*, to approve them, an executive of five members, one elected annually, called the *Directory*. The Convention was dissolved on October 26.

Napoleon Bonaparte now began to be the most prominent figure in French affairs; and after his brilliant successes against the Austrians both north and south of the Alps, and his empty conquest of Egypt, it was not difficult for him to overthrow the government of the Directory. This was accomplished in the

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revolution of Brumaire, Nov. 9, 10, 18, and 19, 1799, the Directory being succeeded by the Consulate, Bonaparte himself being appointed *First Consul* for ten years. The other two consuls, Cambacérès and Lebrun, were to have consultative voices only. The new constitution was proclaimed December 15. Under the appearance of a republic it really established a military monarchy. The history of France for the next sixteen years is virtually the history of Napoleon. In 1802 the constitution was amended, Napoleon being made consul for life, with the right of appointing his successor. In 1804 he was proclaimed emperor, this being confirmed by a popular vote of 3,572,329 against 2,569. The emperor was consecrated at Paris by Pius VII, and in 1805 he was also crowned king of Italy. For years the continental powers, whether singly or in coalitions, were unable to stand against him, though at sea France was powerless after the great victory by Nelson over the French and Spanish fleets at Trafalgar (1805). The Austrians and Russians were decisively defeated at the great battle of Austerlitz (1805); the king of Naples was dethroned and Napoleon's brother Joseph put in his place; another brother, Louis, was made king of Holland; while for a third, Jerome, the kingdom of Westphalia was erected (1807). Prussia was conquered and compelled to accede to humiliating terms. Napoleon was at the height of his power in 1810 and 1811, his empire then extending from Denmark to Naples, with capitals at Paris, Rome, and Amsterdam. By this time, however, the Peninsular War had broken out, which was one immediate cause of his downfall, the disastrous Russian campaign of 1812 being another. The latter cost the French the loss of at least 300,000 men. A new coalition was now formed against Napoleon, and in 1813 he was disastrously defeated by the allies at the great battle of Leipsic. By this time the Peninsular War was drawing to a close and Southern France was actually invaded by Wellington. The allies entered Paris on March 31, 1814. Napoleon abdicated and received the island of Elba as a sovereign principality. Louis XVIII was proclaimed king of France, and concluded the Peace of Paris (May 30, 1814). A congress of the great powers had assembled at Vienna to adjust European affairs, when it was announced that Napoleon had left Elba, returned to Paris, March 20, 1815, and been reinstated without resistance in his former authority. The allied sovereigns proclaimed him an outlaw and renewed their alliance against him. Napoleon, anticipating the attack, crossed the Sambre with 130,000 men, defeated Blücher in the battle of Ligny, and marched against the British, who had taken position at Waterloo. Here on the 18th was fought the decisive battle which resulted in his final overthrow. On July 7 the allies entered Paris for the second time. Napoleon surrendered to the British, and was sent to St. Helena as a prisoner.

Louis XVIII at first governed with the support of a moderate Liberal party, but the re-

actionary spirit of the aristocrats and returned émigrés soon got the upper hand; the country, however, was prosperous. Louis having d. Sept. 16, 1824, his brother, Charles X, succeeded. On July 26, 1830, the Polignac ministry, strongly reactionary in its tendencies, published ordinances suppressing the liberty of the press, and creating a new system of elections. The result was an insurrection during the three days, July 27–29, by which Charles X was overthrown, and Louis Philippe of Orleans proclaimed king, Aug. 9, 1830. During the last days of Charles X's reign a French expedition had captured the city of Algiers, and laid the foundation of the French colony there. During the eighteen years of Louis Philippe's reign the chief events were the taking of the Citadel of Antwerp, the temporary occupation of Ancona, both in 1832, and in 1835 the completion of the conquest of Algeria, But latterly, under the ministry of Guizot, a policy of resistance to all constitutional changes was adopted, and a strong opposition having been formed, on Feb. 24, 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and on Dec. 10, 1848, Louis Napoleon, nephew of the great Napoleon, was elected president for four years. The president, having gained the favor of the army, dissolved the legislative assembly on Dec. 2, 1851, put down all resistance in blood, and by this *coup d'état* established himself as president for the further term of ten years. A plébiscite of 7,839,216 votes confirmed the appointment. On December 2 the president was declared emperor under the title of Napoleon III (a son of the great Napoleon being counted as Napoleon II); and a plébiscite of 7,824,129 votes was again got to confirm the appointment. The Crimean War (1854–55) and the war against Austria on behalf of Italy (1859) distinguished the early part of his reign. The latter greatly aided in the foundation of a United Italy, and gave France the territories of Savoie and Nice (1860). In 1870 the uneasiness of Napoleon and the French at the steady aggrandizement of Prussia broke out into flame at the offer of the Spanish crown to a prince of the house of Hohenzollern. France, not satisfied with the renunciation of the German prince, demanded a guarantee from the king of Prussia that the candidature should never be resumed. This being refused France declared war. One French army was driven back by the Germans and cooped up in Metz, another was pushed northward to Sedan, and so hemmed in that it had to surrender with the emperor at its head. On the news of this disaster reaching Paris the republic was proclaimed. After an almost uninterrupted series of victories the Germans became masters of the French capital (Jan. 28, 1871), and the war ended in France giving up to Germany Alsace and a part of Lorraine, and paying a war indemnity of five milliards of francs ($1,000,000,000). Meanwhile civil war had broken out in Paris, which was suppressed with great difficulty. The assembly elected in 1871 for the ratification of peace with Germany found it expedient to continue their functions.

Theirs being the head of the administration. In 1873 the Thiers administration was overthrown and replaced by one under Marshal MacMahon. In 1875 a republican constitution was drawn up. After the resignation of Marshal MacMahon, which took place before the expiry of his term of office, and the election of M. Grévy to the presidency, the republican party, under the leadership of Gambetta, instituted numerous measures of doubtful expediency, among them being the rehabilitation of the Communards, violent measures regarding the church, and the opening of the Tunis expedition. These measures and others like them created a distrust in the peasant proprietors, the real conservative power in France, in their chosen representatives, and this feeling was by no means allayed by the accession of Gambetta to the premiership. His death, however, which occurred in 1882, left his party without a leader and the people without an idol. At this time, owing to the vacillating policy of the ministry, French influence in Egypt had greatly weakened and the general feeling of distrust was increased by the Tonquin expedition and troubles with China. On Dec. 2, 1887, M. Grévy resigned the Presidency. He was led to take this step by accusations of jobbery and malversations brought against his son-in-law. He was succeeded by M. Marie Francois Sadi-Carnot and a new ministry was formed, with M. Tirard as President of the Council. About this time the political situation was further disturbed by efforts of General Boulanger, whose aim was personal political aggrandizement. He was supported by three reactionary parties—the Orleanists, the Imperialists, and the Legitimists. On account of the efficiency of General Boulanger as minister of war and by his patriotic utterances and his willingness to institute reforms regarding the treatment of the privates and non-commissioned officers, he became very popular among all classes and was looked upon as an idol by many. By force of circumstances, therefore, he was made the figure-head for a movement of discontent and a desire for a revision of the constitution; and the rational and practical institutions which had been established in France by the third republic were seemingly in great jeopardy. Three seats were lost to the Republicans in the elections of Jan. 5, 1888, and early in the same year a new ministry was formed, with M. Floquet as president of the Council. In April General Boulanger was elected to the Chamber of Deputies from the Department du Nord by a large majority and he at once became the leader of the opposition to the government. After a stormy debate, a motion by General Boulanger for the dissolution of the Chamber was rejected by that body and a vote of censure passed upon him, whereupon he resigned. He was reelected, however, the following year by a considerable majority. On the 14th of Feb., 1889, Premier Floquet tendered his resignation of the Cabinet, and a new Cabinet was speedily formed, with M. Tirard as premier.

It was decided by the French Chamber on April 4 to prosecute General Boulanger for threatening the peace of the republic. He was accordingly taken before the High Court of the Senate Aug. 8, and convicted, together with others, of conspiracy and attempt at treason. They were condemned to transportation and imprisonment, but General Boulanger escaped to England. It was proved that he was connected with a plot to restore the Orleanists, and in 1891 he committed suicide.

The next four years were eventful in a measure, but were principally characterized by a general unsteadiness in politics and governmental affairs. France underwent many changes of ministries, and her institutions suffered greatly from numerous strains. A great sensation was created by the failure of the Panama canal scheme, which led to the prosecution of a number of noted men; among them the Comte de Lesseps and his son; Gustave Eiffel, of Eiffel Tower fame; and many politicians and ex-ministers of great prominence. The two de Lesseps and Eiffel, together with others, were found guilty of bribery and corruption in January, 1893, and sentenced to fine and imprisonment. In the case of the Comte de Lesseps the prison sentence was not carried out on account of old age and ill health, and he died the following year. The brilliant career of President Carnot was cut short by the dagger of an assassin, an Italian anarchist by the name of Cesario Santo, during a *fete* given in his honor at Lyons, June 24, 1894. M. Casimir-Perier succeeded him in the Presidency, but resigned after being little more than six months in office. His successor was M. Felix Faure, who was elected by the National Congress, in its regular session at Versailles, in the early part of 1895. Those who had been sentenced on account of the Boulanger plot were now enabled to return through the passage of the amnesty bills, and M. Henri Rochefort was one of the first to take advantage of the general pardon. A Chinese loan of $75,000,000 was raised in France on the guaranty of the Russian government. President Faure was invested with the insignia of the Order of St. Andrew by the Russian ambassador on June 17. The following month an act was passed reorganizing the council of the Legion of Honor. This was done so as to free the order of any suspicion of undue influence. The Ribot ministry, in existence from Jan., 1895, to October of the same year, was succeeded by a Cabinet, of which M. Bourgeois was the Premier. This Cabinet remained in power until April, 1896, when it was in turn sncceeded by a ministry under the leadership of M. Meline. On Sept. 30, 1895, Antananarivo, the capital of Madagascar, was captured by the French, and a treaty was signed which provided for a French protectorate over the island. In June, 1896, Madagascar was formally annexed to France. On June 13, 1896, an unsuccessful attempt was made one life of President Faure while riding in his carriage on the Bois du Boulogne, but no one was injured by the exploding bomb. The President's visit to Russia, in 1897, had a notable significance not only to France and Russia, but to all Europe as well. By the burning of a bazzar in Paris May 5, 1897, given for the benefit of certain religious charities, over one hundred persons lost their lives, many of them being members of the best families of France. The most distinguished was the Duchess d'Alencon, sister of the empress of Austria. President Felix Faure died February 16, 1899, and was succeeded by Emile Loubet.

An event of great importance in France was the international exposition held at Paris from April to November, 1900. France alone had 30,000 exhibitors. See *Paris Exposition* for detailed account.

French Language.— At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were Celtic. After the conquest of Gaul by the Romans all these dialects were gradually supplanted by Latin except in Brittany, where a Celtic dialect still holds its ground. The popular Latin of Gaul of course exhibited considerable differences from the written and classic Latin, and by the seventh or eighth century the literary and the popular languages had come to be quite clearly distinguished as the *Latina* and the *Romana* respectively. Besides the Celtic words, not very numerous, which were imported into the new speech, it was considerably modified by Celtic habits of speech, new sounds being introduced. It was still further modified by the influences introduced with the Teutonic invasions. The half-barbarous conquerors, incapable of mastering the intricacy of Latin inflections, mostly neglected them, using only the simpler forms. They enlarged the vocabulary also by a number of words, mostly terms of war, hunting, etc. After the Franks in Gaul had abandoned their native language and adopted this new Romanic or Romance tongue it became known as the *Francisca*, later *Franceis*, from which the modern term *French* is derived. The oldest known monument of the new dialect is the oath of Louis the German, taken at Strasburg in 842. In the ninth and tenth centuries two main branches or groups of dialects came to be recognized, the *Langue d'Oc*, spoken in the districts south of the Loire, and the *Langue d'Oil* spoken in a variety of dialects in the provinces of the north and east. The former may be said to have reached its height in the Provençal poetry and dialect, known especially in connection with the Troubadours. In the thirteenth century the political superiority of the north threw the Langue d'Oc into the shade, and a dialect of the Langue d'Oil spoken in the central province of Ile de France, where the capital, Paris, was, came to be regarded as the classical language of the country, all other dialects sinking into the condition of *patois*. At the beginning of the sixteenth century Francis I prohibited the use of Latin at court and in the public tribunals, and formally recognized the French as the national language. As one of the Romance languages it is a sister tongue of Italian, Spanish, and Portuguese.

Literature.—French literature proper begins in the eleventh century with the epic or narrative poems known as *chansons de geste*, and produced by the class of poets known as *Trouvères*. These poems belong to Northern France and are very numerous. They are usually divided into three heads: poems relating to French history, in particular to the deeds of Charlemagne, his descendants and vassals; poems relating to Alexander the Great and to ancient history; and poems of the Arthurian cycle, or relating to King Arthur. They are generally written in verses of ten or twelve syllables, and are of a length varying from 1,000 to 20,000 lines. One of the oldest and best examples of the first class is the *Chanson de Roland*, or *Song of Roland*. Of the Arthurian cycle, the *Roman de Rou* and *Roman de Brut;* and of the Alexandrine cycle, the *Alexandre* by Lambert li Cors, and *La Guerre de Troie* (*War of Troy*) by Benoît de St. More, are examples. This song literature is mainly of a sentimental character, and is usually divided into two classes, *romances* and *pastourelles*. Among the principal of the early lyrists are Thibaut de Champagne (1201–53), Charles of Orleans (1391–1465). Rutebeuf (b. 1230), also a writer of fabliaux, is the first of a series of poets. The *Roman de la Rose*, the work, in its earlier part, of Guillaume de Loris, who lived in the first half of the thirteenth century, in the later, of Jean de Meung (d. 1320), is one of the most notable productions of the time. François Villon (1431–1500), the greatest of French poets before the Renaissance, wrote two compositions known as the *Great* and the *Little Testament*.

In prose literature the first important work is the *Histoire de la Couqéute de Constantinople* by Villehardouin. The *Mémoires of the Sieur de Joinville* delineates the life of St. Louis and the exploits of the last Crusade. Froissart (1337–1410), the "Herodotus of his age," gives a vivid picture of the chivalry of the fourteenth century. With Philippe de Commines (1445–1509) we are introduced to Louis XI, and his contemporaries in a style of history which, if less naïve and charming, shows a deeper and more philosophical sense of things. In lighter prose the *Cent Nouvelles* already shows the power of the French language for the short, witty tale.

The revival of classical learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Rabelais (1483–1553), a profound but often gross humorist, and Montaigne (1533–92), an interesting and instructive, though somewhat skeptical essayest, hold the first rank. Calvin (1509–64) did much by his great theological work, *Institution de la Religion Chrétienne*, to mold French prose in the direction of strength and gravity. In poetry Clement Marot (1497–1544) gave a new elegance to the language in his epistles and epigrams. Pierre de Ronsard (1524–85), and the other members of the celebrated *Pléiade*—Iodelle, Belleau, Dubellay, and others—sought to enrich their native tongue by the introduction of classic words, constructions, and forms of verse.

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Du Bartas and D'Aubigné carried on the work of Ronsard. Mathurin Régnier may be said to close this school of poetry. He unites in himself the lighter qualities of the style of Villon and Marot, with the erudition and command of language characteristic of the Ronsardists. Malherbe (1556–1628), the creator of a new taste in literature, opposed with success the tendency of the Ronsard school, and falling into the opposite excess sacrificed everything to correctness. With the Renaissance translations of the classic dramas appeared, and a member of the *Pléiade*, Jodelle (1532–1573), wrote the first regular tragedy (*Cléopatre*) and comedy (*Eugéne*).

The seventeenth century opened with Alexandre Hardy, Rotrou, Tristan, Mairet, DuRyer, and a host of other dramatists, for nearly a hundred can be enumerated in the first quarter of the century. At length Pierre Corneille (1606–84), with his *Cid*, *Cinna*, *Horace*, and *Polyeucte*, brought French tragedy to a degree of grandeur which it has not surpassed. Of seventeenth century prose writers Pascal (1628–62) is vigorous and satirical in his *Lettres Provinciales;* profound, if sometimes mystical, in his *Pensées*. The letters of *Balzac* (1584–1684) and *Voiture* (1598–1648), though rhetorical were valuable as models for elegant prose. Descartes (1596–1650) showed in his *Discours sur la Methode* that the language was now equal to the highest philosophical subjects, and the great work of his disciple, Malebranche, *Recherche de la Vérité*, is equally admirable for its elegance of style and its subtlety of thought.

The age of Louis XIV is known as the golden age of French literature. Besides Corneille, Racine (1639–99) represented the tragic drama, and Molière (1639–193) brought his great masterpieces of comedy on the stage. The "inimitable" La Fontaine (1621–95) wrought his *Contes*, and the most charming collection of fables. For his critical influence, if not for his poetry, Boileau (1636–1711) holds a prominent place. In eloquence the sermons and funeral orations of Bossuet, Bourdaloue, and Massillon take the first rank. Bossuet is also celebrated as a controversialist and theological historian. Very important, too, are the memoir and maxim writers of this time. Among the former are the Cardinal de Retz, Madame de Motteville, Madame de Sévigné (1627–96), and others; among the latter are La Rochefoucauld, St. Evremond, La Bruyère. In fiction Le Sage, who also wrote comedies, produced his immortal *Gil Blas* and the *Diable Boiteux*, and the versatile Fontenelle wrote his *Dialouges des Morts*.

Among the writers of the eighteenth century Voltaire holds the first place. He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher, and he remained at the head of the republic of letters for more than half a century. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712–78), a writer of an eloquent sentimental vein, well represented by his *Nouvelle Héloise* and his famous *Confessions*. His new

theories of politics and education are embodied in his *Contrat Social and Emile.* Buffon devoted himself to the production of his immense natural history. Montesquieu (1689–1755), commencing with the *Lettres Persanes*, a satire on French manners and government, followed with a historical masterpiece, *Considérations sur la Grandeur et al Décadence des Romains*, and finally with his great work, the *Esprit des Lois.* Diderot (1713–83), a powerful and suggestive writer in many departments, and D'Alembert (1717–83), a great geometrician, founded the *Encyclopédie*, a vast review of human knowledge, often hostile to social order, and always to religion. Among the philosophers, Helvetius, D'Holbach, and La Mettrie represent the extreme materialistic and anti-Christian school. Condillac and Condorcet kept most on the side of moderation. Among the writers of fiction Bernadin de St. Pierre (1747–1814), author of *Paul et Virginie*, and Prévost (1697–1763), author of *Manon Lescaut*, are particularly worthy of mention; while dramatic literature was enriched by the *Barbier de Séville* and the *Mariage de Figaro of Beaumarchais.*

Neither the Revolution nor the first empire was favorable to literature. Châteaubriand (1768–1848) and Madame de Stael (1766–1817) gave a new turn to the taste and sentiment of the time, the former in his *Génie du Christianisme* and his *Martyres*, clothing the history of Christianity in the romantic hues of his imagination, the latter in her *Corinne* and *De l'Allemagne* introducing the idealistic spirit and thought of the Germans to her countrymen. A purely reactionary school of thought was headed by Joseph de Maistre (1754–1821), the advocate of theocracy, with a vigorous despotism for its system of government. Later on in the present century the influence of Goethe, Schiller, Shakespeare, Scott, and Byron began to be felt, and a new school, called the *romantic*, as opposed to the old or *classic*, sprung up, headed by Victor Hugo (1802–85), who promulgated the new theories in the preface to his drama of *Cromwell*, and carried them into practise in numerous poems. The most notable of his associates were Alfred de Vigny, author of a volume of *Poëmes*, and of a novel, *Cinq Mars;* Sainte-Beuve, who published several volumes of poetry in those early days, but became famous later on as a critic, perhaps the best France has ever possessed; Alfred de Musset, who produced some of the finest lyrics in the language. Charles Nodier, Gérard de Nerval, the two Deschamps, and, later, Théophile Gautier, with others, also belonged to the band of romanticists. On the stage the dramas of Alexandre Dumas, the elder (1803–74), though melodramatic and of inferior literary value, served as rallying points for the new school. To English readers, however, he is best known by his novels. A reactionary movement was attempted, led by Ponsard (1814–67) and Emile Augier. Casimir Delavigne attempted to combine the classic and romantic schools; and Lamartine (1790–1869) is more than half a romanticist by sentiment and style. Béranger (1780–1857), the greatest of French song writers, may be considered as belonging to neither of the two schools, nor can the sparkling comedies and vaudevilles of Eugène Scribe be claimed by any of the rival parties.

Among novelists, Balzac (1799–1850), by his astonishing series of works, intended to cover the whole ground of human life, has established his claim to the first place. The novels of George Sand (Madame Dudevant, 1804–76), perhaps equally famous, have gained her the reputation of possessing the finest style of any contemporary writer. Low life in Paris was vividly depicted by Eugène Sue (1804–57) in the *Mystères de Paris*, etc. Of a healthy tone are the novels of Frédéric Soulié, Emile Souvestre, and Edmond About (1828–85), and the stories of the two novelists, conjoined in work as in name, Erckmann-Chatrian. The younger Dumas, Victorien Sardou, Octave Feuillet, Ernest Feydeau, Henri Murger, Gustave Flaubert, have developed a realistic style of novel in which social problems are treated with more candor than delicacy. Of late years a school of writers has arisen who strive to outdo the most realistic of their predecessors. The chiefs of this school are Emile Zola, Emile Gaboriau, Victor Cherbuliez, Alphonse Daudet, etc.

In works of history the century has been very prolific, the leading historians being Michaud, Sismondi, Guizot, Amédée Thierry, Mignet, Thiers, Michelet, Henri Martin, Victor Duruy, Louis Blanc. Literary historians are: Villemain, Vinet, J. J. Ampère, Littré, St. Marc-Girardin, Sainte-Beuve, Taine, Demogeot. Philosophy is represented by Lamennais, Victor Cousin, Jouffroy, Rémusat, Auguste Comte, Montalembért, Renan. Among the writers on political economy and sociology are Bastiat, Tocqueville, Chevalier, Jules Simon. Among scientific writers are: Etienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, Duméril, in natural science; Gay-Lussac, Bichat, in chemistry and medicine; and Lagrange and Arago in mathematics. Among Orientalists of note are Champollion, Burnouf, Silvestre de Sacy, and Stanislas Julien. The essayists and literary and art critics are legion. We can only mention by name Théophile Goutier, Philarète Chasles, Léon Gozlan, Paul de St. Victor, Gustave Planche, and St. René Taillandier. Among poets who belong to a date posterior to the Romantic movement, or show different tendencies, may be mentioned Gautier in his later poetry, Baudelaire (1821–67), Leconte de Lisle, François Coppée, Catulle Mendes, and the modern Provençal poets, Frédéric Mistral, and Théodore Aubanel.

Franchise (fran′chīz), in a general and legal sense, a particular privilege or right granted by a prince, sovereign, or government to an individual, or to a number of persons.

Francis I (1494–1547), king of France. He ascended the throne in 1515. In prosecution of his claim to Milan he defeated the Swiss in the plains of Marignano and forced the reigning duke Maximilian Sforza to relinquish the

sovereignty. On the death of Maximilian (1510) Francis was one of the competitors for the empire; but the choice fell on Charles of Austria, the grandson of Maximilian, henceforth known as the Emperor Charles V. From this period Francis and Charles were rivals, and were almost continually at war with one another.

Francis II (1544–1560), king of France, ascended the throne on the death of his father, 1559. The year previous he had married Mary Stuart, only child of James V, king of Scotland. The uncles of his wife, Francis, duke of Guise, and the Cardinal of Lorraine, held the reins of government.

Francis I (1708–1765), emperor of Germany. In 1736 he married Maria Theresa, daughter of the Emperor Charles VI. After the death of Charles VI (1740) he was declared by his wife co-regent of all the hereditary states of Austria, but without being permitted to take any part in the administration. After the death of Charles VII he was elected emperor in 1745.

Francis I (1768–1835), emperor of Austria. He succeeded his father in 1792. France declared war against him in 1792, and hostilities continued till the Peace of Campo Formio, 1776. In 1799 he entered into a new coalition with England and Russia against the French republic. France having been declared an empire in 1804, he assumed the title of *hereditary emperor of Austria.* In 1805 war again broke out between Austria and France. But after the battle of Austerlitz (1805) the Peace of Presburg was signed. In 1809 he again took up arms against France, and in the Peace of Vienna was compelled to surrender 42,000 sq. mi. of territory.

Francis of Assisi (1182–1226), St., founder of the Franciscans. In 1208 he gave himself to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of eleven he formed them into a new order, made a rule for them, and got it sanctioned, though at first only verbally, in 1210 by Pope Innocent III. In 1212 he received from the Benedictines a church near Assisi. Francisa fterward obtained a bull in confirmation of his order, from Pope Honorius III.

Francis'cans are the members of the religious order established by St. Francis of Assisi about 1210. They are also called Minorites, or Fratres Minores which was the name given them by their founder in token of humility, and sometimes Gray Friars, from the color of their garment. The order was distinguished by vows of absolute poverty and a renunciation of the pleasures of the world, and was intended to serve the church by its care of the religious state of the people.

Francis, Joseph (1801–1893) inventor, was b. in Boston, Mass. At the age of eighteen received a prize for a fast rowboat. His great achievements were in the construction of life-saving appliances. He made the first use of iron floating vessels. He received numerous patents, medals, and decorations, and the thanks of Congress for services to his country.

Francis Joseph I, emperor of Austria and king of Hungary and Bohemia, b. 1830; succeeded his uncle, Ferdinand, who abdicated in 1849. The chief events of his reign have been the cession of Lombardy to Italy, as a result of the Austro-French War (1859); and the loss of Venetia, as also Austria's important influence in Germany, the result of the war with Prussia (1866).

Franco-German War of 1870–71.—The immediate occasion of this war was an offer made in June, 1870, by General Prim, then at the head of affairs in Spain, of the crown of that country to Leopold of Hohenzollern, a prince belonging to the reigning house of Prussia. The government of Napoleon III demanded of the king of Prussia that he should forbid the candidature of the prince, and when the prince voluntarily retired from his candidature, still insisted that this renunciation should be formally made by the king, and a guarantee given that the candidature would not be revived. This demand was refused, and a formal declaration of war by France against Prussia was received by Count Bismarck, the chancellor of the North German Confederation, on the 19th of July. Prussia was not only joined, according to treaty, by all the states of the North German Confederation, but also by those of the South, upon whose neutrality Napoleon and the French had counted. The German forces were divided into three armies: the first army had its headquarters at Trèves under General Steinmetz; the second army occupied the Bavarian Palatinate under Prince Frederick Charles; while the third army, under the crown prince of Prussia, was stationed in Northern Baden. The Commander-in-chief of the whole forces was King William of Prussia. The French army, under Napoleon, had its headquarters at Metz, and two advanced divisions were stationed on the borders of France and Germany, the one in the north on the Saar, under General Frossard, the other further south at Weissenburg, under General Douay. The northern army under Bazaine was overtaken by those of Steinmetz and Frederick Charles on the 14th of August, when an engagement at Courcelles took place, in which the Germans were victorious. Meantime the crown prince of Prussia had advanced as far as Nancy. He had still the army of MacMahon to deal with, which had reached Châlons, where it had been reorganized and strengthened. He therefore formed a new army, which was afterward called the army of the Meuse. About August 20 these two armies set out in the direction of Châlons in order to engage the army of MacMahon. Count Palikao, minister of war at Paris, issued an order to Marshal MacMahon to strike northward to the Belgian frontier that he might thence make a descent upon Metz and relieve Bazaine. On September 1 the army of MacMahon was surrounded at Sedan by a force of overwhelmingly greater numbers, and on the following day both army and fortress surrendered by capitulation. Among the prisoners was Napoleon III, who was unexpectedly found

to have been present with the army of MacMahon. One of the first consequences of this defeat was an outburst of rage on the part of the Parisians against the Napoleon dynasty, and a republic was proclaimed. A government of national defense was formed, at the head of which was placed General Trochu. Meantime France had no available army which was strong enough to stand its ground for an instant before the German armies that were now enabled to continue their march upon Paris. The investment of the city was completed September 19. It was not till about the beginning of October that the French were able to organize a new army after the loss of that of MacMahon, and by the beginning of November the war in the open field had been resumed in different centers, but the capitulation of Metz with the army of Bazaine, and that of Strasburg, had set free for further operations large numbers of German troops, and the utmost efforts of the French could not relieve Paris. On February 21 M. Thiers, head of the executive, arrived at Versailles, and preliminaries of peace were signed on February 26, and accepted by the assembly at Bordeaux on March 1. The principal terms were the following: 1, That France should cede to Germany one-fifth part of Lorraine, including Metz, together with the whole of Alsace except Belford and the surrounding district. 2, That France should pay to Germany a war indemnity of five milliards of francs ($1,000,000,000). 3, That certain departments of France should remain in the occupation of the Germans, and should not be fully evacuated until after the payment of the whole indemnity. The definitive treaty of peace, which was signed at Frankfort on May 10, and ratified on the 21st, confirmed in all essential particulars the preliminaries of Versailles.

Fran'colin, a genus of birds belonging to the same family as the partridge, which they

Gray Francolin.

resemble in many respects, though they usually have one or more strong and sharp, horny spurs on the tarsi. It is found in the south of

France, Sicily, Cyprus, and the southern part of Europe generally. The other species belong to Africa, Asia, and Oceania.

Frankfort, Clinton co., Ind., on Prairie Branch River. Railroads: T. St. L. & K. C.; L. E. & W.; L. N. A. & C.; Vandalia Line. Industries: railroad shops, two flouring mills, two iron foundries, and a factory for clay-making machinery. Surrounding country agricultural. F. became a city in 1876. Pop. 1900, 7,100.

Frankfort, Franklin co., Ky., state capital, on Kentucky River, 65 mi. e. of Louisville. Railroads: Louisville & Nashville, and Kentucky Midland. Industries: cotton mill; lumber, whisky, twine and other articles are manufactured. It is a center of trade. The Kentucky Military Institute and the state Institution for Feeble Minded Children are located here. Standard-bred trotting horses are raised in the vicinity. Pop. 1900, 9,487.

Frankfort-on-the-Main, a town of Prussia, in the province of Hessen-Nassau, 20 mi. n.e. of Mayence (Mainz). It is mainly situated on the right bank of the Main. It has many very handsome, and some palatial, private residences with gardens. The Römberg and the Rossmarket are the chief squares in the town. The Römer or town-house was erected about 1405, but not completed in its present form till 1740. The most remarkable of the churches is the Dom or Cathedral of St. Bartholomew. Other buildings are the new opera house, one of the finest buildings of the kind; the courts of justice, of modern construction; the new exchange, a spacious and handsome edifice; the large palace of the prince of Thurn and Taxis; the new railway station, a very elegant edifice, which will favorably compare with any similar structure; the archive-building, post office, the house in which Luther dwelt, and that in which Goethe was born. There are monuments to Gutenberg, Goethe, Schiller, and others. Frankfort is rich in collections connected with literature and art, and in establishments intended to promote them. The chief of these are the Historical Museum, the Städel Art Institute, etc. The manufactures comprise chemicals, ornamental articles of metal, sewing machines, straw hats, soap, perfumery, beer, etc. A great business is done in money and banking. The town is provided with tramways, is a great railway center, and is now reached by the largest vessels navigating the Rhine. Frankfort dates from the time of Charlemagne.

Frankfort-on-the-Oder, a town of Prussia, province of Brandenburg, on the Oder, 52 mi. e.s.e. Berlin. The manufactures consist of machinery and metal goods, chemicals, leather, earthenware, spirits, etc.; and the trade is extensive both by land and water. It has always been an important commercial place. Pop. 54,085.

Franklin, Venango co., Pa., on Allegheny River and French Creek, 123 mi. n. of Pittsburg. Railroads: Allegheny Valley, L. S. & M. S., Erie & Western, New York & Pa. Industries: oil works, flour mill, two iron

foundries, steel casting co., hub works, printing ink co., and other small industries. Surrounding country agricultural and mineral. Only place where lubricating oil is found. The town was first settled in 1795 and became a city in 1868. Pop. 1900, 7,317.

Franklin, Benjamin (1706–1790), writer and statesman, b. at Boston. He was placed with his brother, a printer, to serve an apprenticeship to that trade, and his brother, having started the New England *Courant*, Franklin secretly wrote some pieces for it, and had the satisfaction to find them well received. But, on this coming to the knowledge of his brother, he was severely lectured for his presumption, and treated with great harshness. Soon after he quitted his brother's employment, and at the age of seventeen started for Philadelphia, where he obtained employment as a compositor. Here he attracted the notice of Sir William Keith, the governor of Pennsylvania, who induced him to go to England for the purpose of purchasing types to establish himself in business. He got work in a printing office, and after a residence of eighteen months in London returned to Philadelphia. Here he returned to his trade, and in a short time formed an establishment in connection with a person who supplied the necessary capital. They printed a newspaper, which was managed with much ability, and acquired Franklin much reputation. By his exertions a public library, improved systems of education, a scheme of insurance, etc., were established in Philadelphia. In 1732 he published his *Poor Richard's Almanack*, which continued to be issued till 1757. Being in Boston in 1746 he saw, for the first time, some experiments in electricity, which led him to begin those investigations which resulted in the identification of lightning and electricity, and the invention of the lightning conductor. As member of the provincial assembly of Pennsylvania he showed himself very active, and he was sent (in 1757) to England as the agent of the province. His reputation was now such, both at home and abroad, that he was appointed agent of the provinces of Massachusetts, Maryland, and Georgia. Oxford and Edinburgh conferred on him their highest academical degrees, and the Royal Society elected him a fellow. In 1762 he returned to America; but was again appointed agent in 1764, and took to England a remonstrance against the project of taxing the colonies. He opposed the Stamp Act, and in 1774 presented to the king the petition of the first American Congress. On his return he was elected member of Congress, and exerted all his influence in favor of the Declaration of Independence. In 1776 he was sent to France as commissioner plenipotentiary, to obtain supplies from that court. After the surrender of Burgoyne he concluded with France the first treaty of the U. S. with a foreign power (1778), and was subsequently named one of the commissioners for negotiating the peace with England. On his return to his native country he filled the office of president of Pennsylvania, and served as a delegate in the federal convention in 1787, and approved the constitution then formed. His works include his unfinished *Autobiography*, and a great number of political, antislavery, financial, economic, and scientific papers.

Franklin, Sir John (1786–1847), an English Arctic voyager, b. in Lincolnshire. He entered the navy as a midshipman at the age of fourteen, and was present at the battle of Copenhagen in 1801. He afterward accompanied Captain Flinders on his voyage to the coast of Australia (1801–03). Shortly after his return he was appointed to the *Bellerophon*, and had charge of her signals during the battle of Trafalgar. Two years later he joined the *Bedford*. His Arctic work began in 1819, when he conducted an overland expedition for the exploration of the north coast of America from Hudson's Bay to the mouth of the Coppermine River. On his return to England he was promoted to the rank of captain. In a short time he made a second voyage. On his return in 1827 he received the honor of knighthood. After serving for some years in the Mediterranean he held the post of governor of Tasmania from 1836 to 1843. In 1845 he took command of the *Erebus* and *Terror* in what proved his last polar expedition, as he never returned. In 1850 a document which had been deposited in a cairn thirteen years before, and gave the latest details of the ill-fated expedition was discovered. This paper stated that Sir John died June 11, 1847; that the ships were abandoned in April, 1848; and that the crews, 105 in number, had started for the Great Fish River. None survived, but many relics of the party have been recovered.

Franz-Joseph Land, an island group in the Arctic Ocean, lying n. of Nova Zembla, and consisting of two chief islands, much broken up by fiords, and a number of smaller ones.

Fraser River, the principal river in British Columbia, rising in the Rocky Mountains. It first flows northwest for about 270 mi., then turns south, and after a total course of about 500 mi. falls into the Gulf of Georgia. Gold is found both on the Fraser and its affluents, and the salmon fisheries are important. Its principal affluents are the Thompson, Quesnelle, and Stuart rivers. New Westminster, Hope, Yale, and Lytton are on its banks.

Frater'nities, a voluntary association of men for promoting their common interest, business, or pleasure. In this wide sense it includes all secret and benevolent societies, the monastic and sacerdotal congregations, the order of knighthood, and also guilds, trades unions, and the like. In a limited sense it is applied to religious societies for pious practises and benevolent objects. They were often formed during the Middle Ages, from a desire of imitating the holy orders. Many of these societies, which did not obtain or did not seek the acknowledgment of the church, had the appearance of separatists, which subjected them to the charge of heresy. The pious fraternities which were formed under the direction of the church, or were acknowledged by it, were either required by their rules to afford assist-

tance to travelers, to the unfortunate, the distressed, the sick, and the deserted, on account of the inefficiency of the police, and the want of institutions for the poor, or to perform certain acts of penitence and devotion. Of this description were the Fratres Pontifices, a brotherhood that originated in Tuscany in the twelfth century, where they maintained establishments on the banks of the Arno, to enable travelers to cross the river, and to succor them in case of distress. A similar society was afterward formed in France, where they built bridges and hospitals, maintained ferries, kept the roads in repair, and provided for the security of the highways. Similar to these were the Knights and Companions of the Santa Hermandad (or Holy Brotherhood) in Spain; the Familiars and Cross-bearers in the service of the Spanish Inquisition; the Calendar Brothers in Germany; the Alexians in Germany, Poland, and the Netherlands, etc. The professed object of the Alexians, so called from Alexius, their patron saint, was to visit the sick and imprisoned; to collect alms for distribution; to console criminals, and accompany them to the place of execution; to bury the dead, and to cause masses to be said for those who had been executed, or for persons found dead. There were also Gray Penitents (an old fraternity of an order existing as early as 1264 in Rome, and introduced into France under Henry III), the black fraternities of Mercy and of Death; the Red, the Blue, the Green, and the Violet penitents, so called from the color of their cowl; the divisions of each were known by the colors of the girdle or mantle. The fraternity of the Holy Trinity was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from hospitals. See *College Fraternities.*

Fraud, an act or course of deception deliberately practised with the view of gaining an unlawful or unfair advantage, such as the obtaining of goods under false pretenses, and the like. All frauds or attempts to defraud, which cannot be guarded against by common prudence, are indictable at common law, and punishable arbitrarily according to the heinousness of the offense. Every species of fraud which the law takes cognizance of renders voidable every transaction into which it enters as a constituent, material element. Fraud may be by false representation, concealment of material circumstances that ought to be revealed, underhand dealing, and by taking advantage of imbecility or intoxication. A constructive fraud in law is such fraud as is involved in an act or contract which, though not originating in any actual evil or fraudulent design, yet has a tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests. Gross criminal frauds are punishable by way of indictment or information; such as playing with false dice, causing an illiterate person to execute a deed to his prejudice, etc. Frauds are not indictable at common law unless they be such as affect the public, as using false weights and measures.

Fraunhofer (froun'hō-fĕr), Joseph von (1787–1826), German optician. His many improvements in glass making, in optical instruments, and in the polishing of lenses, have been eclipsed by his investigation of the innumerable, dark, fixed lines in the solar spectrum, known as *Fraunhofer's lines.* The importance of this discovery can scarcely be overestimated. It led to the invention and use of the spectroscope, to the science of spectroscopy, and to all our present knowledge of solar and stellar chemistry.

Frechette (frĕ-shet'), Louis Honore, a French Canadian author, b. at Levis, Quebec, 1839. He was educated at Nicolet College and Laval University, studied law and was called to the bar of Lower Canada, represented his native county in the Dominion parliament (1874–79), contributed to various newspapers, and became editor of *La Patrie* in Montreal in 1884. He has published collections of poems entitled *Mes Loisirs, Les Fleurs Boréales* and *Les Oiseaux de Neige,* the dramas of *Félix Poutré, Papineau, The Thunderbolt,* etc. In prose he has written *Petite Histoire des Rois de France, Lettres à Basile,* etc.

Frederick, a town in Maryland, 44 mi. n.w. of Baltimore. It has an extensive trade in live stock, grain, flour, tobacco, wool, etc. Pop. 8,200.

Frederick I, Barbarossa (1121–1190), German emperor, son of Frederick, duke of Suabia, received the imperial crown in 1152 on the death of his uncle, the Emperor Conrad III. His principal efforts were directed to the extension and confirmation of his power in Italy.

Frederick II, Hohenstaufen (1194–1250), son of the emperor Henry VI and of the Norman princess Constance, heiress of the Two Sicilies. He remained under the guardianship of Innocent III till 1209, when he took upon himself the government of Lower Italy and Sicily. His ambition aimed at the subjugation of Lombardy, the mastership of all Italy, and the reduction of the popes to their old spiritual office as the leading bishops in Christendom. This led him into constant struggles in Germany and Italy. He was one of the ablest and most accomplished of the long line of German emperors, and art, literature, commerce, and agriculture received every encouragement at his hands.

Frederick I (1657–1713), king of Prussia, son of the great elector. He succeeded his father as elector of Brandenburg in 1688; became king of Prussia in 1700; and was all his reign bitterly opposed to France.

Frederick II (1712–1786), **king of Prussia,** known as Frederick the Great. He was the son of Frederick William I, and the Princess Sophia Dorothea of Hanover, sister of George II of England. He was brutally treated by his father, and in 1733, he was obliged to marry the Princess Elizabeth Christina, daughter of Ferdinand Albert, duke of Brunswick-Bevern. Frederick William gave the castle of Schönhausen to her, and to the prince the county of Ruppin, and in 1734 the town of Rheinsberg, where he lived, devoting himself

chiefly to literary pursuits. The death of his father raised him to the throne in 1740, and it was not long before he asserted the claims of the house of Brandenburg to a part of Silesia then held by Maria Theresa. But his proposals being rejected, he occupied Lower Silesia in December, 1740, defeated the Austrians near Mollwitz, and at Czaslau (Chotusitz), and the first Silesian war was terminated by the peace signed at Berlin, July 28, 1742, leaving Frederick in possession of Silesia. Soon the second Silesian war broke out, the result of which was equally favorable for Frederick. By the Peace of Dresden he retained Silesia and acknowledged the husband of Maria Theresa, Francis I, as emperor. During the eleven following years of peace Frederick devoted himself to the domestic administration, to the improvement of the army, and at the same time to the muses. He perfected the organization of his army, which was increased to 160,000 men, and anticipated his enemies by the invasion of Saxony (1756), with which the Seven Years' War, or third Silesian war, commenced. The Peace of Hubertsburg (1763) terminated this war, Frederick keeping Silesia and ceding nothing. Frederick came out of the Seven Years' War with a reputation which promised him, in the future, a decisive influence in the affairs of Germany and Europe. His next care was the relief of his kingdom, drained and exhausted by the contest. This he prosecuted with great diligence and liberality. On the partition of Poland in 1772 Frederick received a large accession to his dominions. In 1778–79 he frustrated the designs of the Emperor Joseph II on Bavaria, and the War of the Bavarian Succession was terminated without a battle by the Peace of Teschen (May 13, 1779). In the evening of his active life Frederick concluded, in connection with Saxony and Hanover, the confederation of the German princes, July 23, 1785. He was a man of the highest abilities.

Frederick III (1831–1888), Emperor of Germany, succeeded William I March 9, 1888. In 1858 he married the princess royal of Britain, eldest daughter of Queen Victoria. He commanded the army of the Oder in the war with Austria (1866), and in the Franco-German War he led the army which ultimately forced Napoleon III and his army to surrender at Sedan.

Fredericksburg, Spottsylvania co., Virginia, on the Rappahannock, 60 mi. n.e. of Richmond. Here the Federal forces under Burnside were defeated by the Confederates under Lee on Dec. 13,1862. Pop. est. 1897, 5,500.

Frederick William (1620–1688), of Prussia, generally called the Great Elector. At the age of twenty he succeeded his father as elector of Brandenburg. He must be considered as the founder of the Prussian greatness, and as the creator of a military spirit among his subjects. He left to his son a country much enlarged and improved, an army of 28,000 men, and a well-supplied treasury.

Frederick William I (1688–1740), king of Prussia, son of Frederick I and father of

Frederick the Great (II). While crown prince (1706) he married Sophia Dorothea, daughter of the Elector of Hanover, afterward George I of England. On his accession to the throne, in 1713, he endeavored to increase the army and reform the finances, and became the founder of the exact discipline and regularity which have since characterized the Prussian soldiers.

Frederick William II (1744–1797), king of Prussia. He succeeded his uncle Frederick the Great in 1786, and shared in the second partition of Poland.

Frederick William III (1770–1840), son of Frederick William II. During his reign Prussia suffered much at the hands of Napoleon, including defeats at Jena, Eylau, Friedland, etc., and lost a large portion of territory, which, however, was recovered after the fall of Napoleon.

Frederick William IV (1795–1861), king of Prussia, son of Frederick William III. When he succeeded to the throne by the death of his father in 1840 his first proceedings were both of a popular and praiseworthy character. Latterly his mind gave way, and he sank into a state of hopeless imbecility.

Free Church of Scotland, a Presbyterian church organized as a separate body from the Established Church in 1843. In 1834 the General Assembly passed a *veto act*, which declared that no minister should be intruded into a parish church against the will of the people, and that a majority of male heads of families, full members of the church, should be able to bar an obnoxious presentee. This act brought the ecclesiastical and civil powers into conflict. The struggle was brought to an issue by the judgment of the House of Lords in 1842, affirming a decree of the Court of Session, which required the presbytery of Auchterarder to induct the presentee to Auchterarder parish without regard to the dissent of the parishioners. In 1843 the members of the General Assembly were convened at Edinburgh, when the Rev. Dr. David Welsh instead of constituting the meeting in the ordinary manner, rose and read a protest, pointing out that the civil courts had undue powers of interference with the Established Church, and concluding by asserting the right of the protesters, in the circumstances, to withdraw to a separate place of meeting for the purpose of taking steps on behalf of themselves and their adherents for separating in an orderly way from the Establishment. The moderator and other members of Assembly withdrew to another place of meeting and constituted themselves the Free Church of Scotland.

Free Cities, cities having an independent government of their own, and virtually forming states by themselves; a name given to certain cities of Germany which were members of the German Confederation, and exercised sovereign jurisdiction within their own boundaries. At the time of the French Revolution the free or "imperial" cities numbered no fewer than fifty-one; but with the exception of Hamburg, Lübeck, and Bremen, they have

all been deprived of their privileges as the result of various political changes.

Free Congregations, sometimes called "Protestant Friends," a sect of German Rationalists, who at first professed to be Christians, but now reject the doctrines of miraculous revelation and a personal deity. There are upward of 120 congregations of them in Germany, and a few in the U. S.

Freehold, in law, an estate in real property, held either in fee-simple or fee-tail, in which case it is a freehold of inheritance, or for the term of the owner's life; also, the tenure by which such an estate is held.

Freeman, Edward Augustus (1823–1892), English historian and archæologist, educated at Trinity College, Oxford. In 1883 he became Regius professor of modern history at Oxford. His works are very voluminous.

Freemasonry, a term applied to the organization of a society calling themselves *free* and accepted *masons*, and all the mysteries therewith connected. This society, if we can reckon as one a number of societies, many of which are unconnected with each other, though they have the same origin and a great similarity in their constitution, extends over almost all parts of the globe, and is consequently of the greatest service to travelers who are members of the craft. According to its own peculiar language it is founded on the practise of social and moral virtue. It claims the character of charity in the most extended sense; and brotherly love, relief and truth are inculcated in it. Fable and imagination have traced back the origin of freemasonry to the Roman Empire, to the Pharaohs, the temple of Solomon, the Tower of Babel, and even to the building of Noah's ark. In reality it took its rise in the Middle Ages along with other incorporated crafts. Skilled masons moved from place to place to assist in building the magnificent sacred structures—cathedrals, abbeys, etc.—which had their origin in these times, and it was essential for them to have some signs by which, on coming to a strange place, they could be recognized as real craftsmen and not impostors. Freemasonry in its modified and more modern form dates only from the seventeenth century. The modern ritual is said to have been partly borrowed from the Rosicrucians and Knights Templars, and partly devised by Elias Ashmole, the founder of the Ashmolean Museum. Freemasonry, thus modified, soon began to spread over the world. In 1725 it was introduced into France by Lord Derwentwater; and in 1733 the first American lodge was established. The United Grand Lodge of England recognizes only two species of Freemasonry—the *Craft* and the *Royal Arch;* Scotch, Irish, American, and Continental lodges acknowledge higher degrees; but these, with the exception of the *Mark Degree*, are not universal. In ordinary freemasonry there are three grades—apprentice, fellow-craft, and master-mason—each of which has its peculiar initiatory ceremonies; the last of these grades, however, is necessary to the attainment of the full rights and privileges of brotherhood.

Free Port, a harbor where ships of all nations may enter on payment of a moderate toll, and load or unload. Goods may be stored at first at free ports without paying any duty; the goods may then be either reshipped for export on paying a mere transit duty, or they may be admitted for home consumption on payment of the usual full customs of the country.

Freeport, Stephenson co., Ill., on Pecatonica River, 118 mi. n.w. of Chicago. Railroads: Illinois Central, C. M. & St. P., C. & N. W., C. & G. W. Industries: manufacture of agricultural implements, two flouring mills, iron foundry, two buggy factories, and bicycle factory. Surrounding country agricultural. The town was first settled in 1835, and became a city in 1855. Pop. 1900, 13,258.

Freethinkers, an epithet applied to the English deists of the seventeenth and eighteenth centuries who argued for natural as against revealed religion. Anthony Collins (who first made it a name of a party by his *Discourse of Freethinking*), and his friend, John Toland, are among the chief of the early freethinkers. Another able writer on the same side was Math Tindal, whose *Christianity as Old as the Creation*, caused a great sensation. Lord Bolingbroke and Hume take the lead among advanced freethinkers. In France Voltaire and the encyclopedists, D'Alembert, Diderot, and Helvetius, led the opposition against revealed religion. The same spirit became fashionable in Germany in the reign of Frederick the Great. The term is now generally applied to designate Rationalists in general, who are to be found among Christians as well as non-Christians.

Free trade, the term applied to national commerce when relieved from such interferences as is intended to improve or otherwise influence it; that is, unrestricted by laws or tariffs, and not unduly stimulated by bounties. In all countries it was long held to be of importance to encourage native production and manufactures by excluding from their own markets, and from the colonial markets over which they had control, the competing produce and manufactures of other countries. On this theory the great body of British commercial legislation was founded until 1846, when the policy of free trade was introduced in grain, and afterward gradually extended by the repeal of the navigation laws in 1849 and other great measures, until nearly all British commercial legislation has been brought into conformity with it. Free trade can hardly yet be said to have been adopted as a principle of commercial policy by any nation except Great Britain. As an economic principle free-trade is the direct opposite to the principle or system of *protection*, which maintains that a state can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this protecting countries either prohibit the importation of foreign goods by direct legislation, or impose such duties as shall, by enhancing the price, check the

introduction of foreign goods. The advocates of what is called *fair trade* in Britain profess a preference for free trade were it universal or even common; but seeing that Britain is almost the sole free-trade country in the world, declare that a policy of reciprocity is required for the protection of British traders and manufacturers. The progress made by Britain since 1846 is adduced as a striking proof of the wisdom of her free-trade policy.

Freezing (Congelation, or Solidification), the transformation of a liquid into a solid under the influence of cold. Each liquid always solidifies at the same temperature, which is called its freezing point, and the solid also melts again at the same temperature. Thus the freezing point and the melting point, or point of fusion, are the same, and the point is always the same for the same substance. Consequently the freezing point of water, or the melting point of ice (32° F.), is taken for one of the fixed points in thermometry. The freezing point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero F. It has been shown that the increase of pressure upon water, and upon all substances which expand in freezing, will lower the freezing point; and that such substances as wax, spermaceti, sulphur, and paraffin, which contract in freezing, have the freezing point raised by pressure. Artificial freezing is attained by the liquefaction of solids or the evaporation of liquids. These processes absorb heat, and by abstracting it from the surrounding substances freeze the latter. Among freezing mixtures are, 1, two parts of pounded ice or fresh snow and one part of common salt, which causes the thermometer to fall to −4°; 2, equal parts of water, of powdered crystallized nitrate of ammonia, and of powdered crystallized carbonate of soda, which produces a cold of −7°; 3, three parts of snow with four parts of crystallized chloride of calcium, producing a temperature of −54°; while 4, with a mixture of liquid nitrous oxide and carbon disulphide a temperature of −220° is reached.

Freiberg (frī′ber*h*), a German mining town, the center of the mining district of Saxony, 20 mi. w.s.w. of Dresden, near the Mulde. There are still remains of its former walls, towers, and ditches. The principal buildings and establishments are the cathedral, the mining academy with a museum attached, the townhouse, the castle, the royal silver refinery, etc. The Freiberg district yields silver, copper, lead, and cobalt. Pop. of town, 27,042.

Freiburg fri′bu̇r*h*) (or Freiburg im Breisgau), a town of Baden, on the Dreisam, 42 mi. s.s.e. of Strasburg. The chief buildings are the cathedral, a large and beautiful Gothic structure, with a fine portal richly sculptured, and surmounted by a tower with a spire of exquisite open work 380 ft. high; the Ludwigskirche; the university, founded in 1456; the museum, theater, grand-ducal palace, etc. The manufactures are numerous, but not individually of great extent. Pop. 41,310.

Freiligrath (frī′li*h*-rät), Ferdinand (1810–1876), German lyric poet, b. at Detmold. In 1838 he published a volume of his collected poems, which proved successful. In 1848 he took part in the revolutionary movements, publishing political poems, one of which led to his being put on trial for treason. This trial, in which he was acquitted, is memorable for another reason, being the first jury trial ever held in Prussia. Many of his songs are yet very popular. Germany is indebted to him for many admirable translations from foreign languages.

Fremont, Dodge co., Neb., on Platte River, 36 mi. w. of Omaha. Railroads: Union Pacific; Sioux City & Pacific; Fremont, Elkton, and Missouri Valley. Industries: brewery, flour mill, two iron foundries, woolen mill, hemp and twine factory, two planing mills, carriage, furniture, cigar factories, stock yards and pork packing. The town was first settled in 1856 and became a city in 1869. Pop. 1900, 7,241.

Fremont, Sandusky co., O. It has a considerable trade, lines of steamers running from the city, which stands at the head of steam navigation on the Sandusky River, to the principal ports of Lake Erie. Pop. 1900, 8,439.

Fremont, John Charles (1813–1890), American explorer, b., at Savannah, Ga. He conducted five separate and adventurous expeditions which explored the passes of the Rocky Mountains. He took an active part in the conquest of Upper California, and served in the Civil War. He was the first candidate of the Republican party for president, but was defeated by Buchanan in 1856. He d. at New York City.

French Beans (or Kidney-beans), the *haricots* of the French, are the products of the *Phaseolus vulgaris*, supposed to be a native of the East Indies, but now commonly cultivated in all parts of the globe. This plant is a twining annual, bearing alternate leaves, on footstalks, composed of three oval pubescent folioles. The flowers are whitish, somewhat resembling those of the pea. The seeds are more or less kidney-shaped. A great number of varieties are cultivated, among which is that commonly called *Lima bean.* They are eaten prepared in various manners.

Freneau, Philip (1752–1832), poet, was b. in New York City. Graduated at Princeton in 1771. Captured by a British cruiser in 1780 he wrote *The British Prison Ship.* As editor of the *National Gazette* his virulent attacks on the Federalists aroused Hamilton's anger. His poems were numerous, chiefly of Revolutionary times.

Frere, Sir Henry Bartle Edward (1815–1884), statesman and administrator, b. at Clydale, Wales. He entered the East India Company's civil service in 1833; mastered the native languages and introduced important improvements into the system of tax collection. In 1850 he succeeded Sir Charles Napier as chief commissioner at Scinde. He was the author of a life of his uncle, John Hookham Frere, numerous lectures, pamphlets, etc.

Frere, John Hookham (1769–1848), b. in Lon-

don. He is now chiefly remembered as one of the writers in the *Anti-Jacobin Review* at the close of the last century; and afterward connected with the establishment of the *Quarterly Review* in 1809.

Fresco Painting, a method of mural painting in water colors on fresh or wet grounds of lime or gypsum. Mineral or earthy pigments are employed, which resist the chemical action of lime. In drying, the colors are incorporated with the plaster, and are thereby rendered as permanent as itself. In producing fresco paintings, a finished drawing on paper, called a cartoon, exactly the size of the intended picture, is first made, to serve as a model. The artist then has a limited portion of the wall covered over with a fine sort of plaster, and upon this he traces from his cartoon the part of the design suited for the space. As it is necessary to the success and permanency of his work that the colors should be applied while the plaster is yet damp, no more of the surface is plastered at one time than the artist can finish in one day. A portion of the picture once commenced needs to be completely finished before leaving it, as fresco does not admit of retouching after the plaster has become dry. On completing a day's work, any unpainted part of the plaster is removed, cutting it neatly along the outline of a figure or other definite form, so that the joining of the plaster for the next day's work may be concealed. The art is very ancient, remains of it being found in India, Egypt, Mexico, etc. Examples of Roman frescoes are found in Pompeii and other places. After the beginning of the fifteenth century fresco painting became the favorite process of the greatest Italian masters, and many of their noblest pictorial effects are frescoes on the walls of palaces and churches. Some ancient wall paintings are executed in what is called *Fresco Secco*, which is distinguished from true fresco by being executed on dry plaster, which is moistened with lime water before the colors are applied. Fresco painting has in recent years again been revived.

Fresno, Fresno co., Cal., 207 mi. s. of San Francisco. Railroads: S. P., and S. F. & S. J.; terminus of Sanger & Pollesky branch of S. P. Industries: agricultural works, iron foundry, flouring mill, cooperage, furniture, and box factories. It is the raisin center of the U. S. The town was first settled in 1873 and became a city in 1885. Pop. 1900, 12,470.

Freycinet (frā-si-nā), CHARLES LOUIS DE SAULCES DE, French statesman, b. at Foix, 1828. He was elected to the senate in 1876; was minister of public works 1877; minister for foreign affairs 1879: and president of the council and minister for foreign affairs for longer or shorter periods in 1882 and 1886. He is the author of several important works on engineering.

Freytag (frī′tȧh), GUSTAV, German poet, dramatist and novelist, b. 1816. He was editor of the *Leipsic Grenzboten* from 1848 to 1870, and has produced numerous successful plays, tales, and poems.

Friction, in physics, the effect of rubbing, or the resistance which a moving body meets with from the surface on which it moves. Friction arises from the roughness of the surface of the body moved on and that of the moving body. No such thing can be found as perfect smoothness of surface in bodies. In every case there is, to a less or greater extent, a roughness or unevenness of the parts of the surface, arising from peculiar texture, porosity, and other causes, and therefore when two surfaces come together the prominent parts of the one fall into the cavities of the other. This tends to prevent or retard motion, for in dragging the one body over the other an exertion must be used to lift the prominences over the parts which oppose them. What is called the *coefficient of friction* for any two surfaces is the ratio that subsists between the force necessary to move one of these surfaces horizontally over the other, and the pressure between the two surfaces. Thus the coefficient of friction for oak and cast iron is 38:100, or .38. Friction plays a most important part in nature and art; for instance, but for it threads could not be made nor textile fabrics manufactured.

Friendly Islands (or Tonga Islands), a cluster in the South Pacific Ocean. They consist of three groups, which are divided from each other by two narrow channels, and number altogether about 150, with a collective area of about 400 sq. mi. The largest island is Tongatabu, in the s. group, with an area of 120 sq. mi., and containing the capital, Nukualofa. Vavao, in the n. group, which is named after it, is next Tongatabu in size; the center group is called Hapai. The trade is considerable, the chief exports being copra, coffee, and wool. Pop. 19,250.

Friendly Societies, societies formed for the mutual advantage of the members, and based on the principle that it is by the contribution of the savings of many persons to one common fund that the most effectual provision can be made for casualties affecting, or liable to affect, all the contributors. The Ancient Order of Foresters and the Independent Order of Odd Fellows far outstrip all the other orders in numerical and financial strength, the former possessing a membership of 686,127, of which 38,569 belong to the U. S., and an accumulated capital of $18,400,000; the latter 627,594 members, and funds to the sum of $34,035,000, being the wealthiest friendly society in the world, as the Ancient Order of Foresters is the largest numerically.

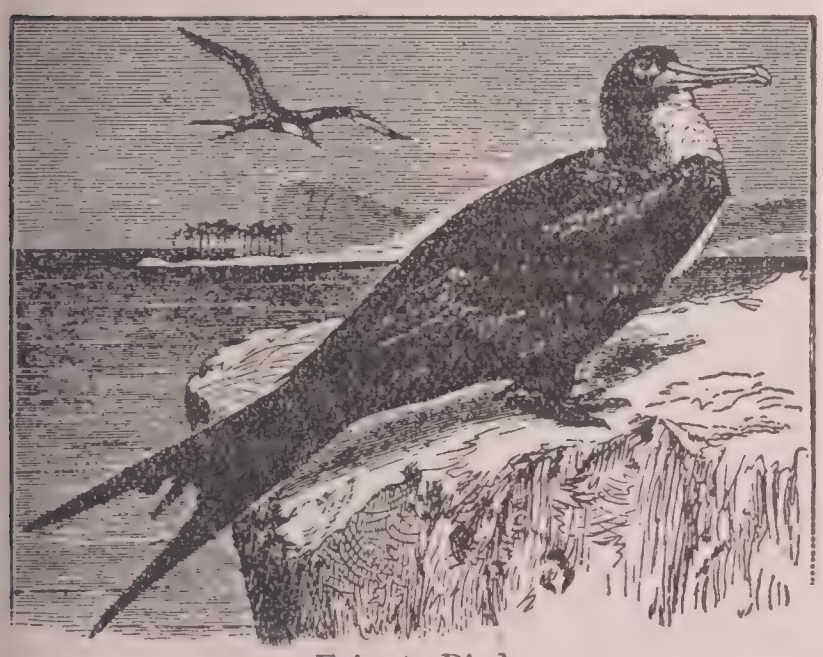
In the U. S., among fraternal organizations, the following are the principal, the membership numbering, 2,836,000: Free Masons, Independent Order of Odd Fellows, Ancient Order of United Workmen, Knights of Pythias, Knights of Honor, Improved Order of Red Men, Royal Arcanum, Knights and Ladies of Honor, American Legion of Honor, Knights of the Maccabees, Modern Woodmen of America, United American Mechanics, Equitable Aid Union, Order of Chosen Friends, Catholic Mutual Benefit Association, National Union, Independent Order of B'nai B'rith,

FROGS AND TOADS. 1. Peron's Tree-frog (Hyla Peronii). 2. Toad, Fire-toad (Bombinator igneous). 3. Hyperolius flavomaculatus. 4 Tree-frog (Dendrobates fantasticus. 5. Prostherapis femoralis. 6. Common wart-skinned Toad (Bufo forniosus). 7. Phyllomedusa hypocondrialis. 8. Changeable Toad (Bufo variabilis). 9. Pond frog (Rana esculenta).

Catholic Benevolent Legion, Order of United Friends, Catholic Knights of America, Order of the Golden Cross, Royal Templars of Temperance, Ancient Order of Druids, Royal Society of Good Fellows, United Order of Pilgrim Fathers, Order of the Golden Chain, Knights of the Golden Eagle.

Frig'ate, in the navy, among ships of war of the older class, a vessel of a size larger than a sloop or a brig and less than a ship of the line; usually carrying her guns on the main deck and on a raised quarter-deck and forecastle, or having two decks. Such ships were often fast sailers, and were much employed as cruisers in the great wars of the eighteenth and early part of the nineteenth centuries. Since the introduction of iron-clad vessels the term frigate has been applied to war-ships having a high speed and great fighting power.

Frigate Bird (or Man-of-War Bird), a tropical web-footed bird of the family Pelecanidæ. Including the long tail the male bird reaches 3 ft. in length, but the body is comparatively small. The bill is longer than the head, strong, hooked at the point, and sharp. In proportion to their size their wings are longer than in any other bird, having an extent of 7 ft. or



Frigate Bird.

more. Their flight is powerful and graceful; they neither swim nor wade, but catch the flying fishes in the air, and cause fishing birds to disgorge their prey, which they dexterously seize as it falls.

Frigga (or Frigg), in northern mythology, the wife of the god Odin, the goddess after whom Friday is named. She is a goddess in some respects corresponding with Venus, and is often confounded with Freya.

Fringe-tree, a small tree belonging to the same natural family with the olive, and having snowwhite flowers which hang down like a fringe, inhabiting America from lat. 39° to the Gulf of Mexico. It is frequently cultivated in gardens as an ornamental plant. Four other species of *Chionanthus* are known, two of which inhabit the West Indies, the third Ceylon, and the fourth Australia.

Frisians, a German tribe who, about the beginning of the Christian era, occupied the territory between the mouths of the Rhine and

the Ems. They became tributaries of Rome under Drusus, and lived for some time on friendly terms with their conquerors, but were driven to hostilities by oppression. Their modern history is chiefly connected with Holland and Hanover.

Frith, William Powell, R.A., b. at Studley, near Ripon, 1819. He was commissioned by the queen to paint the marriage of the Prince of Wales. He was elected R.A. in 1852, and is a member of several foreign academies. Large engravings have been produced from a number of his pictures. In 1887–88 he published his autobiography.

Fro'bisher, Sir Martin (1535–1594), one of the great Elizabethan navigators, b. near Doncaster, England. He made three expeditions to the Arctic regions for the purpose of discovering a northwest passage to India, and endeavored to found a settlement north of Hudson's Bay. In 1585 he accompanied Sir Francis Drake to the West Indies. In the years 1590 and 1592 he commanded squadrons against the Spaniards. In 1594 he was sent to the assistance of Henry IV of France, when, in an attack on a fort near Brest, he was mortally wounded.

Froebel (fr*eu*'bĕl), Friedrich Wilhelm August (1782–1852), German educationist. After an unsettled and aimless youth, and with somewhat imperfect culture, he started teaching, and soon developed a system which has become famous under the name of *Kindergarten.*

Frog, the common name of a number of animals belonging to the class Amphibia, having four legs with four toes on the fore feet and five on the hind, more or less webbed, a naked body, no ribs, and no tail. Owing to the last peculiarity, frogs belong to the order of amphibians known as Anura, or tailless Amphibia. The tongue is fleshy, and is attached in front

Common Frog.

to the jaw, but is free behind, so that the hinder extremity of the tongue can be protruded. Frogs are remarkable for the transformations they undergo before arriving at maturity. In the spring the spawn is deposited in ponds and other stagnant waters in large masses of gelatinous matter. These masses, with black globules scattered through them, soon manifest change, and after a time the young escapes as a tadpole, as an animal with

short body, circular suctorial mouth, and long tail, compressed from side to side. Gills project on either side of the head from a cleft which answers in position to the gill opening of fishes. The hind limbs first appear as buds, later the fore limbs project, the gills disappear, the lungs becoming more fully developed; the tail gradually shrinks and disappears, and the animal which was at first fish-like, then closely resembled a newt (or tailed Amphibian), finally assumes the adult or tailless form. The mature frog breathes by lungs, and cannot exist in water without coming to the surface for air. Frogs swim with rapidity and move by long bounds, being able from the power of the muscles of their hind legs to leap many times their own length.

Froissart (frwȧ-sȧr), JEAN (1337–1405), a French poet and historian, was b. at Valenciennes. He received a liberal education, and took orders in the church, but his inclination was more for poetry and gallantry. At the age of eighteen he went to England. After returning to the Continent and traveling for some time, he again visited England, and in 1361–66 he was a secretary to the queen. After the death of Queen Philippa, Froissart became curé of Lestines in Hainaut. After many years of a quiet life he again began his travels, and again visited England after a lapse of forty years. Little is known of the closing part of his life, which terminated at Chimay. The best edition of his *Chronicle* is that of Buchon.

Frost is the name we give to the state of the weather when the temperature is below the freezing point of water (32° F.). It is often very destructive to vegetation, owing to the fact that water, which is generally the chief constituent of the juices of the plants, expands when freezing, and bursts, and thus destroys the vesicles of the plant. In the same way rain water, freezing in the crevices of rocks, breaks up their surfaces, and often detaches large fragments. Hoar frost is frozen dew. It may either freeze while it is falling, when it is found loosely scattered on the ground; or being deposited as dew in the early part of the night it may freeze during a subsequent part of it, owing to radiation. It is generally seen most profusely in spring and autumn, because at those times, while on clear nights the cold is sufficient to freeze the dew, the days are at the same time sufficiently warm to cause a very considerable quantity of moisture to evaporate into the air.

Frost Bite, a condition caused by the action of frost on the human economy. It is generally local and partial, varying from ordinary chilblain to complete death of part frozen. The simplest treatment consists in coaxing back the vitality of the part affected by means of friction.

Frosted Glass, glass roughened on the surface, so as to destroy its transparency, in consequence of which the surface has somewhat the appearance of hoar frost. The term *frosted* is also applied to the dead or lusterless appearance of gold and silver jewelry when polishing the surface is omitted.

Froude (frȯd), JAMES ANTHONY (1818–1894),

historian and miscellaneous writer, b. at Totness, Devonshire. Between the years 1856 and 1869 appeared his great work, *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*, which was very popular, though it received but doubtful approval from historians. He was elected rector of St. Andrews University in 1869; traveled in the U. S. in 1874; and visited the Cape Colony on a political mission, 1874–75. He was made literary executor to Carlyle, and his *Life of Carlyle*, and *Carlyle's Reminiscences*, and *Letters and Memorials of Jane Welsh Carlyle*, as edited by him, provoked an extraordinary amount of interest and controversy. Among his other works are, *Short Studies on Great Subjects; English in Ireland in the Eighteenth Century; Julius Cæsar.*

Fruit, in botany, the seed of a plant, or the mature ovary, composed essentially of two parts, the pericarp and the seed. In the more general sense the term is applied to the edible, succulent products of certain plants, generally covering and including their seeds. The hardier sorts of fruits, such as are indigenous to the U. S., or which have been cultivated to any important extent here, are the apple, pear, plum, cherry, apricot, peach, and nectarine; the gooseberry, currant (red, white, and black), raspberry, strawberry, mulberry. The more important fruits requiring a warm climate are the fig, date, grape, orange, lime, banana, tamarind, pomegranate, citron, breadfruit, olive, almond, melon, cocoanut, etc. Some fruits are of immense economic importance, either from supplying food to great numbers of people (dates) or from furnishing beverages in extensive use (as wine from the grape). The value of orchard products in the U. S. has shown a very marked increase in the past ten years.

Fry, ELIZABETH GURNEY (1780–1845), English philanthropist, b. at Norwich. Converted by William Savery, an American Quaker, she joined the Society of Friends and in 1811 began preaching. In 1800 she married Joseph Fry, a London merchant. Her great public work began in 1817 on the formation of the society for the improvemement of female prisoners in Newgate. Largely through her exertions the condition of the female prisoners was greatly improved. She went with her brother (1818) to visit the prisons of Scotland and the North of England. The House of Commons took official notice of her work, commending it in the highest terms. In 1827 she visited Ireland. In 1838 she went to France and received permission to visit all the prisons in the country. In 1840 she traveled through Belgium, Holland, Prussia, and in 1841 visited Copenhagen. She d. at Ramsgate.

Fuad Pasha, MEHEMED (1814–1869), Turkish statesman and man of letters, was b. at Constantinople, d. at Nice. He was four times minister of foreign affairs, and for five years grand vizier; and was the chief support of the reform party in the Turkish Empire. He wrote poetry, political pamphlets, and a Turk-

ish grammar, which has been translated into several languages.

Fuca'ceæ, a nat. order of dark colored algæ, consisting of olive-colored inarticulate seaweeds, distinguished from the other algæ by their organs of reproduction, contained in common chambers or conceptacles, united in club-shaped receptacles at the ends or margins of the fronds. Fucaceæ exist in all parts of the ocean, and, though all are probably occasionally attached, they may exist as floating masses, like the gulf weed.

Fuchsia (fū'shi-a) (named after the discoverer Leonard *Fuchs*, a German botanist), a genus of beautiful flowering shrubs, natives of South America, Mexico, and New Zealand, characterized by having a funnel-shaped, colored, de-

a.—Fuschia; *b.*—garden variety.

ciduous, four parted calyx, sometimes with a very long tube; four petals set in the mouth of the calyx tube, and alternating with its segments; eight exserted stamens, and a long style with a capitate stigma.

Fucus, a genus of seaweeds, comprising various common seaweeds which have a flat or compressed forked frond, sometimes containing air vessels. Many of the species are exposed at low water; they form a considerable proportion of the seaweeds thrown up on some coasts, and are used for manure and for making kelp. Most contain iodine.

Fuel, carbonaceous matter, which may be in the solid, the liquid, or the gaseous condition, and which, in combining with oxygen, gives rise to the phenomenon of heat, the heat being made use of for domestic, manufacturing, or other purposes. The most important of the gaseous fuels is common coal gas, which is now commonly applied for the heating of rooms by means of gas fires and gas stoves. The principal liquid fuels are petroleum, shale-oil, creosote, the various animal and vegetable oils, and alcohol. It is only the mineral oils that are used to any great extent for producing heat. Alcohol is only employed in operations requiring the application of a small volume of heat, and in such it is as convenient and manageable a fuel as can be desired. Successful

attempts have been made in recent times to discover methods by which liquid fuel, and more especially petroleum, may be applied to the heating of steam boilers. In some of the systems it is the combustion of the oil itself, supplied in the form of spray, that produces the heat; in others the oil is volatilized by means of superheated steam, and the gas is burned in the furnace from ordinary pipes as in a gas stove. The heating power of petroleum is considerably greater than that of coal, and in a ship, for instance, it would occupy less space, while the laborious process of stoking would be dispensed with. Creosote has been successfully employed as fuel in the process of armor-plate bending. Peat is used as fuel, more so in the British Isles than in the U. S. Wood charcoal is another kind of fuel which is extensively used in metallurgy, chemistry, and in various industrial arts. It kindles quickly, emits few watery or other vapors while burning, and, when consumed, leaves few ashes, and those very light. They are, therefore, easily blown away, so that the fire continues open, or pervious to the current of air which must pass through it to keep it burning. This sort of fuel, too, is capable of producing as intense a heat as can be obtained by any; but in violent heats it is quickly consumed, and needs to be frequently supplied. Coke or pit-coal, charred, is a fuel which possesses in many respects the same properties as charcoal of wood. It is employed for producing intense melting heats. Various kinds of artificial fuel are manufactured. These are composed of different ingredients, of which coal slack or dust is the most important. The coal dust is mixed with some adhesive substance, such as clay, lime, coal tar, etc., and compressed into bricks. Slack-coal has also been employed as fuel in an entirely different mode. It is ground as fine as possible, and blown into the furnace, where it burns much in the same way as the spray of liquid fuel. In the U. S., for domestic purposes, wood, and anthracite or bituminous coal are chiefly depended upon; some charcoal is used, and gas and coal oil are growing in favor for both heating and cooking in the cities. The stoves used for consuming coal oil and gas are favorites with our housekeepers, having no attendant dust or smoke.

Fuentes d'Ono'ro, a village of Spain, province of Salamanca, about 16 mi. w. s. w. of Ciudad Rodrigo, the scene of two engagements fought between Wellington and Masséna on May 3 and 5, 1811, the result of which was that the French were forced across the Portuguese frontier, and an end was put to the French invasion of Portugal.

Fuerteventu'ra, one of the Canary Islands, separated from Lancerota by the strait of Bacayna. Cabras on the east coast has a good harbor. Area 758 sq. mi.; pop. about 11,600.

Fugger Family, a distinguished German family, early admitted among the hereditary nobility, and now represented by two main lines of princes and several minor noble

branches. Latterly the highest places of the empire were held by the Fuggers, and princely families thought themselves honored by their alliance.

Fuji-Yama (or Fusi-Yama), a dormant volcano of a symmetrical, cone-like shape, in the island of Hondo, Japan, the sacred mountain of the Japanese. It has been quiescent since 1707; is 12,400 feet in height, and is visible in clear weather for nearly a hundred miles.

Ful'gurite, any rocky substance which has been fused or vitrified by lightning. More strictly, a vitrified tube of sand formed by the intense heat of lightning penetrating the sand, and fusing a portion of the materials through which it passes.

Fulham (ful'am), one of the London parliamentary boroughs, bounded by the Thames, and the boroughs of Chelsea, Kensington, and Hammersmith. Pop. 1891, 91,640.

Fuller, Margaret. See *Ossoli* (*Margaret Fuller*).

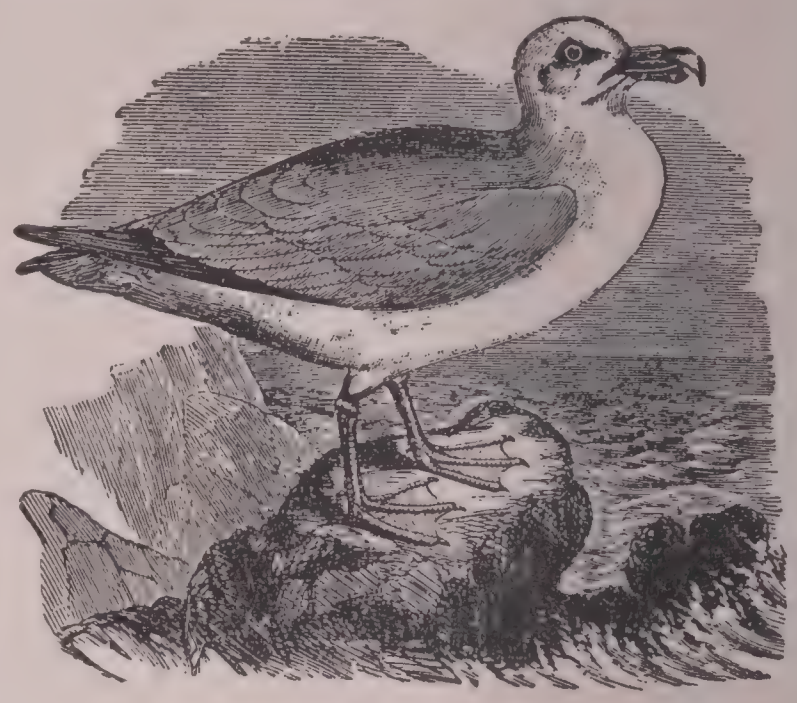
Fuller, Thomas (1608–1661), an eminent historian and divine of the Church of England, b. in Aldwinkle, in Northamptonshire. Several of his writings are English classics, remarkable for quaintness of style, wit, sagacity, and learning. Among the more important are: *History of the Holy War*, *Church History of Britain*, and the *Worthies of England*, a production valuable alike for the solid information it affords relative to the provincial history of the country, and for the profusion of biographical anecdote and acute observation on men and manners.

Fuller, Melville Weston, jurist, b. in 1833 at Augusta, Me. At the age of twenty he graduated at Bowdoin College. He studied law at Harvard and was admitted to the bar in his native city in 1855. He became editor of the Augusta *Age*, and in 1856 was elected city attorney. Later he moved to Chicago, where he practised law for thirty-two years. In 1862 he was a member of the Illinois Constitutional Convention, and the following year was elected to the state legislature. He was a member of the Democratic National Conventions from 1864 to 1880 inclusive. On April 30, 1888, he was nominated Chief Justice of the U. S. by President Cleveland. He took the oath of office October following. He is an able jurist.

Fuller's Earth, a variety of clay or marl, compact, but friable, unctuous to the touch, and of various colors, usually with a shade of green. It is useful in scouring and cleansing cloth, as it imbibes the grease and oil used in preparing wool. It consists of silica 50 per cent., alumina 20, water 24, and small quantities of magnesia, lime, and peroxide of iron.

Fulling-mill, a mill for fulling cloth by means of pestles or stampers, which beat and press it to a close or compact state, and cleanse it. The principal parts of a fulling-mill are the wheel, with its trundle which gives motion to the tree or spindle, whose teeth communicate that motion to the pestles or stampers, which fall into troughs wherein the cloth is put, with fuller's earth to be scoured and thickened by this process of beating.

Fulmar, a natatorial or swimming oceanic bird about the size of a large duck. It inhabits the northern seas in prodigious numbers, breeding in Iceland, Greenland, Spitzbergen, the Shetland and Orkney islands, the Hebrides, etc. It feeds on fish, the blubber of whales, and any fat, putrid, floating substance that comes in its way. It makes its nest on sea cliffs, in which it lays only one egg. The natives of St. Kilda value the eggs above those



Fulmar.

of any other bird. The fulmar is also valued for its feathers and down, and for the oil found in its stomach, which is one of the principal products of St. Kilda. When caught or assailed it lightens itself by disgorging the oil from its stomach. There is another and larger species found in the Pacific Ocean.

Fulmination, a term used in chemistry to denote the sudden decomposition of a body by heat or percussion, accompanied by a flash of light and a loud report. Fulminating compounds, or fulminates, are explosive compounds of fulminic acid with various bases, such as gold, mercury, platinum, and silver. The old fulminating powder is a mixture of sulphur, niter, and potash. Fulminate of mercury forms the priming of percussion caps.

Fulminic Acid, a peculiar acid known only in combination with certain bases, and first discovered along with mercury and silver, with which it forms powerfully detonating compounds.

Fulton, Robert (1765–1815), who claimed to be the introducer of steam navigation on American waters, was b. in Pennsylvania. He adopted the profession of portrait and landscape painter, and in his twenty-second year proceeded to England for the purpose of studying art under West. There he became acquainted with the duke of Bridgewater, Earl Stanhope, and James Watt, and was led to devote himself to mechanical engineering. In 1794 he took a patent for a double inclined plane, which was intended to supersede locks on canals; and he also patented a mill for sawing marble, machines for spinning flax,

and making ropes, a dredging machine, etc. In 1797 he went to Paris, where he produced the first panorama that was exhibited there. He also, after some trials, was successful in introducing a boat propelled by steam upon the Seine. During a visit to Scotland he had seen and obtained drawings of the *Charlotte Dundas*, a steam vessel which had plied with success on the Forth and Clyde Canal. His chief occupation in Paris, however, was the invention of torpedoes for naval warfare. He returned to America in 1806, and built a steamboat, the *Clermont*, of considerable dimensions, which began to navigate the Hudson River in 1807. Its progress through the water was at the rate of 5 mi. an hour. In 1814 he constructed the first war steamship, and was engaged upon an improvement of his submarine torpedo when he died.

Fumaria'ceæ, a small nat. order of exogenous plants. The species are slender-stemmed, herbaceous plants, generally erect, though some climb by means of their twisting leaf-stalks. Many species are objects of cultivation by the gardener for the sake of their showy flowers. All are astringent and acrid plants, and are reputed diaphoretics and aperients. They inhabit the temperate and warm regions of the northern hemisphere and South Africa.

Fu'mitory, a genus of plants, nat. order Fumariaceæ. Several species are known, natives of Europe, Asia, and America. They are slender, annual herbs with much-divided leaves, and purplish flowers in racemes at the top of the stem or opposite the leaves.

Funchal (fun-shal'), the capital of the island of Madeira, situated on a bay on the s. coast. It stretches for nearly a mile along the shore, and presents a thoroughly European appearance. It is a coaling station for steamers, and is much resorted to by invalids afflicted with pulmonary complaints. Pop. 19,752.

Function, in math. a quantity so connected with another that no change can be made in the latter without producing a corresponding change in the former, in which case the dependent quantity is said to be a *function* of the other; thus the circumference of a circle is a *function* of the diameter; the area of a triangle is a *function* of any two of the sides and the angle they contain.

Function, the specific office or action which any organ or system of organs is fitted to perform in the animal or vegetable economy. *Vital functions*, functions immediately necessary to life, as those of the brain, heart, lungs, etc. *Natural* or *vegetative functions*, functions less instantly necessary to life, as digestion, absorption, assimilation, expulsion, etc. *Animal functions*, those which relate to the external world, as the senses, voluntary motions, etc.

Fundy, Bay of, a large inlet of the Atlantic, on the e. coast of North America, separating Nova Scotia from New Brunswick. At its inner extremity it divides into Chignecto Bay, and Minas Channel and Basin, with smaller continuations. It is noted for its impetuous tides, which cause a rise and fall of from 12 to 70 feet, and the navigation is dangerous. At its entrance are Grand Manan and other islands. A ship railway is being constructed to connect Chignecto Bay with Northumberland Strait.

Fungi (fun'jī), a large, natural order of cryptogamous or flowerless plants, comprehending not only the various races of mushrooms, toadstools, and similar plants, but a large number of microscopic plants growing upon other plants, and substances, which are known as molds, mildew, smut, rust, brand, dry rot, etc. They are among the lowest forms of vegetable life, and from the readiness with which they spring up in certain conditions, their germs are supposed to be floating in the atmosphere in incalculable numbers. Some diseases are produced by fungi. Fungi differ from other plants in being nitrogenous in composition, and inhaling oxygen and giving out carbonic acid gas. Berkeley divides fungi into two great sections, the first having the spores naked, and comprising agarics, boleti, puffballs, rust, smut, and mildew; the second comprising the morels, truffles, certain molds, etc., in which the spores are in sacs. These are subdivided into six principal orders.

Funston, Frederick, brigadier-general, was born in Ohio in 1865. When two years old he moved with his parents to Carlyle township, Allen co., Kan. He graduated from the high school at Iola Kan., in 1886. After teaching a short time he entered the state university at Lawrence, remaining there two years. He made some researches in botany and was appointed in 1895 as a commissioner to explore Alaska and report on the flora of the country. He camped the winter of 1893–94 on the Klondike. In 1896 he became an insurgent in Cuba under General Garcia. After being wounded, he was captured by the Spaniards, but was released and returned to the United States. When the Spanish war began he became colonel of the 20th Kansas volunteers and was ordered to Manila. He became brigadier-general of volunteers for bravery. In April, 1899, he, with a few volunteers, swam a river under heavy fire and fastened a rope to the opposite bank. In March, 1901, he led a party into Northern Luzon and captured Aguinaldo. For this President McKinley made him a brigadier-general in the regular army.

Fur and **Fur Trade.**—Fur is the fine, soft hair covering of certain animals, especially the winter covering of animals belonging to northern latitudes. The term fur is sometimes distinctively applied to such coverings when prepared for being made into articles of dress, etc., while the name of peltry is given to them in an unprepared state or when merely dried. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, muskrat, squirrel, hare, rabbit, the chinchilla, bear (black, gray, and brown), otter, sea otter, seal, wolf, wolverine or glutton, marten, ermine, lynz, coypou, polecat, opossum, fox, etc. All the preparation that skins require before being sent to the market is to make them perfectly dry, so as to prevent them from putre-

fying. This is done, by exposing them to the heat of the sun or a fire. The small skins are sometimes previously steeped in a solution of alum. When stored in large quantities they must be carefully preserved from dampness, as well as from moths. The fur-dresser, on receiving the skins, first subjects them to a softening process. He next cleans them from loose piece of the integument by scraping them with an iron blade. Finally, the fur is cleaned and combed, after which it is handed over to the cutter, who cuts the furs out into the various shapes required to make different articles.

In Europe the fur trade is fed chiefly by Russia, which yields great quantities of furs, especially in the Asiatic portion of her dominions. Austria, Turkey, Scandinavia, etc., also yield a certain quantity. The fur trade of America has long been highly important, and has given origin to several great trading companies, of which the Dutch East India Company was first. The French early took up the fur trade in Canada, and their chain of forts and trading posts at one time extended from Hudson's Bay to New Orleans. Quebec and Montreal were at first trading posts. In 1670 Charles II granted to Prince Rupert and others a charter empowering them to trade exclusively with the aborigines of the Hudson's Bay region. A company, then and after called the *Hudson's Bay Company*, was formed, which for a period of nearly two centuries possessed a monopoly of the fur trade in the vast tract of country known as the Hudson's Bay Territory. In the winter of 1783–84 another company was formed at Montreal, called the *Northwest Fur Company*, which disputed the right of the Hudson's Bay Company, and actively opposed it. After a long and bitter rivalry the two companies united in 1821, retaining the name of Hudson's Bay Company. The monopoly which had hitherto been enjoyed by the original company about Hudson's Bay was now much extended; but in 1868 an act of Parliament was passed to make provision for the surrender, upon certain terms, of all the territories belonging to the company, and for their incorporation with the Dominion of Canada. In 1869 the surrender was carried out, Canada paying $1,500,000 to the company by way of compensation. The trade in furs conducted by citizens of the U. S. has been extensive, but in a greater degree the result of individual enterprise than of the management of gigantic corporations. The Alaska Fur Company holds two of the Aleutian Islands in lease from the government with the sole right of killing yearly not more than 100,000 fur seals.

Furies (Eumenides, Erinnyes), deities in the Greek mythology, who were the avengers of murder, perjury, and filial ingratitude. Æschylus, in his celebrated tragedy of the *Eumenides*, introduced fifty furies, and with them Fear and Horror, upon the stage. They were regarded with great dread, and the Athenians hardly dared to speak their names, but called them the *venerable goddesses*. It was by a similar euphemism the name Eumenides, signifying the soothed or well-pleased goddesses, was introduced. Erinnyes, the more ancient name, signifies the hunters or persecutors of the criminal, or the angry goddesses.

Furlong (that is, "furrow-length"), a measure of length, 40 rods, poles, or perches, equal to 220 yards, the eighth part of a mile.

Furnace, a place where a vehement fire and heat may be made and maintained, as for melting ores or metals, heating the boiler of a steam engine, warming a house, baking pottery or bread, and other such purposes. Furnaces are constructed in a great variety of ways, according to the different purposes to which they are applied. In constructing furnaces the following objects are kept in view: 1, To obtain the greatest quantity of heat from a given quantity of fuel. 2, To prevent the dissipation of the heat after it is produced. 3, To concentrate the heat and direct it as much as possible to the substances to be acted upon. 4, To be able to regulate at pleasure the necessary degree of heat, and have it wholly under the operator's management. An *air furnace* is one in which the flames are urged only by the natural draught; a *blast furnace*, one in which the heat is intensified by the injection of a strong current of air by artificial means; a *reverberatory furnace*, one in which the flames in passing to the chimney are thrown down by a low arched roof upon the objects which it is intended to expose to their action.

Furneaux Islands (fêr'nō), a group belonging to Tasmania, at the e. end of Bass Strait, including Flinders Island with an area of 513,000 acres; Cape Barren Island, 110,000 acres; and Clarke Island, 20,000 acres. The inhabitants, who number about 620, many of them "half castes," procure a living by seal fishing, and preserving mutton birds, a species of petrel. The islands are named after the officer who was second in command in Captain Cook's second voyage.

Fur'nivall, Frederick James (1825–), b. at Egham, in Surrey. He has been mainly instrumental in establishing the Early English Text Society, the Chaucer Society, the New Shakespeare Society, the Browning Society, the Wickliffe Society, and the Shelley Society. He has edited numerous works, chiefly through the medium of some of these societies, notably the Six-Text edition of Chaucer's *Canterbury Tales*.

Fur Seal, a name given to several of the Otariidæ or "eared" seals which have a dense covering of fine under fur. The best known and most valuable is the fur seal or seabear of some of the islands connected with Alaska, especially St. Paul's and St. George's, where it breeds. See *Seal*, also *Fur and Fur trade*.

Fürth (fürt), a town in Bavaria, 6 mi. w.n.w. of Nürnberg, at the confluence of the Pegnitz with the Rednitz. It has important and varied manufactures, including mirrors, picture frames, jewelry, gold leaf, lead pencils, spectacles, machinery, etc. Pop. 35,327.

Fuse, a tube filled with combustible matter, used in blasting, or in discharging hollow pro-

jectiles, etc. There are many varieties in use, such as the fuse used in mining and quarrying, which usually consists of a tube filled with a slow-burning composition, which gradually burns down to the charge; the *concussion* and *percussion fuses* for hollow projectiles, which explode the charge when an object is struck; the *electric fuse*, which is ignited by the passage of an electric spark through it; and *time* or *mechanical fuses*, used in some forms of torpedo, and with such explosives as dynamite and gun-cotton.

Fusee', the cone or conical part of a watch or clock, round which is wound the chain or cord. It is a mechanical contrivance for equalizing the power of the mainspring; for as the action of a spring varies with its degree of tension, the power derived from the force of a spring requires to be modified according to circumstances before it can become a proper substitute for a uniform power. In order, therefore, to correct this irregular action of the mainspring, the fusee on which the chain or catgut acts is made somewhat conical, so that its radius at every point may be adapted to the strength of the spring.

Fuseli (fū'se-li), JOHN HENRY (1741–1825), a painter, b. at Zürich. He was educated for the church, but a political pamphlet written by him and Lavater led to his taking refuge in England in 1765, bent on a literary career. He devoted himself to art, went to Italy, and studied there for nearly nine years. He lectured on painting in 1799, and was keeper of the Royal Academy in 1804. Among his notable pictures are his contributions to Boydell's Shakespeare Gallery, and forty-seven pictures from Milton.

Fusel Oil, a heavy, oily, inflammable fluid with a high boiling-point, disagreeable cutting odor, and pungent taste, which is separated in the rectification of ordinary spirit distilled from grain, malt, potatoes, molasses, beet-root, etc. The composition of this fluid depends on the materials used in the manufacture of the spirit, but it may be said to consist to a large extent of ethylic and amylic alcohol. Fusel oil acts very deleteriously on the animal system, and this is the reason why inferior spirits are so injurious in their effects.

Fusing-point, the degree of temperature at which a substance melts or liquefies. This point is very different for different metals. Thus potassium fuses at 136° F., bismuth at 504°, lead at 619°, zinc at 680°, silver 1832°, gold 2282°. Malleable iron requires the highest heat of a smith's forge (2912°); while cerium, platinum, and some other metals are infusible in the heat of a smith's forge, but are fusible before the oxyhydrogen blow pipe.

Futhork (fu̇'thork), the name given to the earliest or runic alphabet in use among the Teutonic and Gothic nations of Northern Europe, so called from its first six letters, f, u, th, o, r, k.

G

G, the seventh letter in the English alphabet. English *g hard* is a guttural mute, the "voiced" or soft or sonant sound corresponding to the "breathed" or hard or surd sound *k* (or *c* hard). This sound of *g* is what the letter always has before *a* (except in *goal*), *o*, *u*, and when initial also before *e* and *i* in all words of English origin, and when final. The *soft* sound of *g*, or that which it more commonly has before *e*, *i*, and *y*, as in *gem*, *gin*, *gymnastics*, is a palatal sound the same as that of *j*, and did not occur in the oldest English or Anglo-Saxon.

G, in music, (*a*) the fifth note, and dominant of the normal scale of C, called also *sol;* (*b*) the lowest note of the grave hexachord; in the Guidonian system *gamma ut;* (*c*) a name of the treble clef, which is seated on the G or second line of the treble staff, and which formerly had the form of G.

Ga'bion, a large, wickerwork casket of cylindrical form, but without bottom. In a siege, when forming a trench, a row of gabions is placed on the outside nearest the fortress, and filled with earth as it is thrown from the trench, so as to form a protection against the fire of the besieged. Each gabion is about 20 in. in diameter, and 33 in. in height, but this height is usually increased by placing a row of fascines on the top after the interior has been filled up.

Gaboon', THE, an estuary on the w. coast of Africa, opening from the Gulf of Guinea immediately n. of the equator. Several rivers discharge themselves into it. The Gaboon territory forms part of the French Congo territory. The chief tribes are the Mpongwa, or Gabonese, and the Fans, who carry on an active trade with Europeans in ivory, copal, ebony, dyewoods, etc.

Ga'briel ("hero or man of God"), according to Biblical history, the angel who announced to Zacharias the birth of John, and to Mary the birth of the Saviour. In Jewish mythology he is one of the seven archangels. The rabbins say he is the angel of death for the Israelites, and according to the Talmud he is a prince of fire, who presides over thunder and the ripening of fruits. In Mohammedan theology he is one of the four angels employed in writing the divine decrees, and the angel of revelation, in which capacity he dictated the Koran to Mohammed.

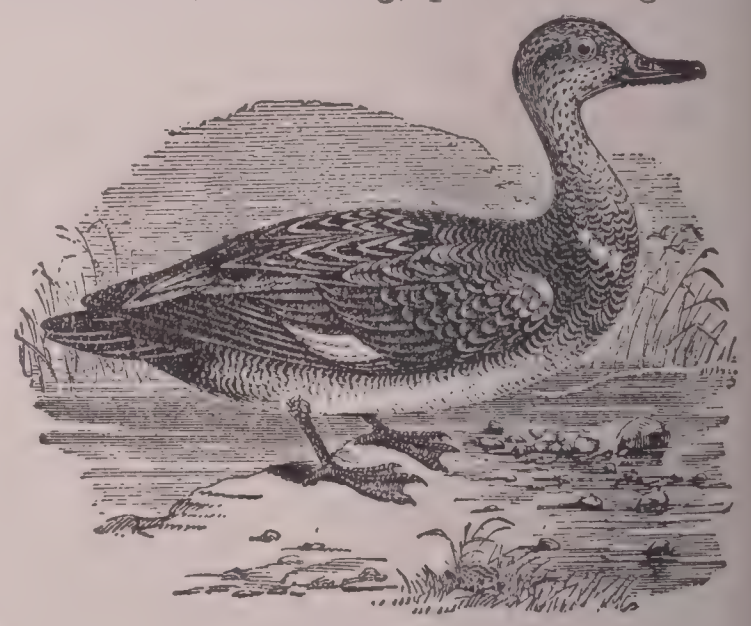
Gade (gä'deh), NIELS WHILHELM (1817–1890), one of the leading Scandinavian composers, b. at Copenhagen, where, in 1841, by his overture entitled *Echoes of Ossian*, he gained the prize of the Musical Union. He was supported during his studies abroad by a royal stipend, and in 1844 was appointed to succeed Mendelssohn in the direction of the Gewandhaus concerts at Leipsic. His works, which are Mendelssohnian in character, include seven symphonies, several overtures, sonatas, quintets, etc.

Gadfly, a name commonly applied to various insects. The ox gadfly is about 7 lines in length; thorax yellow, with a black band; abdomen white; terminal segments fulvus; wings dusky. This species attacks the horse also, the female depositing her eggs in the skin of these animals in considerable numbers. In a short time the eggs are matured, and produce a *larva* or worm, which immediately pierces the skin, raising large lumps or tumors filled with pus, upon which the larva feeds. Cattle exhibit great alarm and excitement at the presence of the gadfly, and rush wildly about, with head stretched forward and tail stuck out, to escape from their tormentor. These pests are common in the different sections of the U. S.

Gadsden Purchase, a strip of territory south of the Gila River and included in the state of Arizona, containing 45,555 sq. mi. It was purchased from Mexico for $10,000,000, Dec. 30, 1853, by James Gadsden, minister to that country.

Gadsden, Etowah co., Ala., on Coosa River. Railroads: Louisville & Nashville, N. C. & St. L., Southern, Gadsden & Attala Union Ry. Industries: cotton mill, two iron foundries, pipe works, two furnaces, grist mills. Surrounding country agricultural and mineral. Pop. 1900, 4,282.

Gadwall', a species of duck not so large as the mallard, with long, pointed wings and a



Gadwall,

vigorous and rapid flight. North America as far down as South Carolina is its favorite habitat.

Gael (gāl), the name of a branch of the Celts inhabiting the Highlands of Scotland, Ireland, and the Isle of Man. Gadhel, or Gael, is the only name by which those who speak the Gaelic language are known to themselves

By way of distinction the Highlanders of Scotland call themselves Gael Albinnich (Gaels of Albin), and the Celtic population of Ireland call themselves Gael Erinnich (Gaels of Erin).

Gaelic is the name now generally restricted to that dialect of the Celtic language which is spoken in the Highlands of Scotland, and hence distinguished from Manx and Irish, the other two kindred dialects, which scholars of the present day include under the name (or rather spelling) Gaedhelic. Robert Calder Mackay, or Robb Donn, and Duncan Ban M'Intyre, of Glenorchy, are the two most noteworthy poets among the Scottish Highlanders in modern times. They both belong to the eighteenth century. Gaelic poetry still continues to be written not only in Scotland but even in America.

Gaff, a spar used in ships to extend the upper edge of fore-and-aft sails which are not set on stays. The fore-end of the gaff, where it embraces the mast, is termed the *jaw*, the outer end the *peak*. The jaw forms a semicircle, and is secured in its position by a jaw-rope passing round the mast.

Gage, Lyman J., secretary of the treasury, b. in New York in 1836. He moved to Chicago in 1855, and in 1858 entered the service of the Merchants Savings, Loan & Trust Co. Later he became manager of the Bankers' Clearing-House, and was elected president of the First National Bank in 1882. In the following year he was chosen president of the American Bankers' Association, holding that office for three years. He was president of the Civic Federation of Chicago from 1894 to 1895, and was chosen secretary of the treasury by President McKinley in 1897.

Gainesville, Cooke co., Tex., on Trinity River, 285 mi. n.e. of Austin. Railroads: Gulf, Col. & Santa Fe, and M. K. & T. Industries: brick yards, ice factories, flour and planing mills, foundry, soap and broom works. Cotton, grain, and live stock are raised. Pop. 1900, 7,874.

Gainsborough, Thomas (1727–1788), an English painter, b. at Sudbury, in Suffolk. He was one of the original thirty-six academicians. He rivaled Sir Joshua Reynolds as a portrait painter, and showed no less originality in landscape.

Gaius (or Caius), a Roman lawyer of the time of Adrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his *Institutes* are particularly important; first, as having been for centuries, down to the time of Justinian, one of the most common manuals of law; secondly, as having been the foundation of the official compendium of the law which occupies an important place in the reform of the judicial system by Justinian; and thirdly, as the only tolerably full, systematic, and well-arranged source of the old Roman law.

Galap'agos (the Spanish for "tortoises"), a group of thirteen islands of volcanic origin in the North Pacific Ocean about 600 mi. w. of the coast of Ecuador, to which they belong; area 2,950 sq.mi. The most important are Albemarle, 60 mi. long by 15 broad, and rising 4,700 ft. above the sea, Indefatigable, Chatham, Charles, James, and Narborough.

Galate'a, in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. The monster having surprised them crushed Acis beneath a rock.

Galatia, the ancient name of an extensive region in Asia Minor; so called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the third century B. C. These were compelled by Attalus, king of Pergamos, to settle within well-defined limits between Paphlagonia, Pontus, Cappadocia, Lycaonia, Phrygia, and Bythinia.

Galatz (or Galacz), a town and port in Roumania, in Moldavia, on the left bank of the Danube, between the confluence of the Sereth and Pruth. The trade was formerly entirely in the hands of the Greeks, but now many English and other foreign houses have established themselves. The chief exports are grain (principally maize), wine, planks, and deals, tallow, etc. The imports are chiefly British manufactures, sugar, tin plates, iron and steel, coal, oil, fruits, tobacco, fish, glassware, leather, coarse cloth. Pop. 80,000.

Gal'axy (or Milky Way), in astronomy, that long, luminous track which is seen at night stretching across the heavens from horizon to horizon, and which, when fully traced, is found to encompass the heavenly sphere like a girdle. This luminous appearance is occasioned by a multitude of stars so distant and blended as to be distinguishable only by the most powerful telescopes. At one part of its course it divides into two great branches, which remain apart for a distance of 150° and then reunite; there are also many other smaller branches that it gives off. At one point it spreads out very widely, exhibiting a fan-like expanse of interlacing branches nearly 20° broad; this terminates abruptly and leaves here a kind of gap. At several points are seen dark spots in the midst of some of the brightest portions; one of the most easily distinguished of these dark spots has long been known as the "coal sack." According to Herschel's hypothesis, our sun and planetary system form part of the Milky Way.

Galba, Servius Sulpicius (3 B. C.–69 A. D.), Roman emperor, successor of Nero. Caligula appointed him general in Germany, and Claudius sent him in A. D. 45 as pro-consul to Africa, his services there obtaining him the honors of a triumph. He then lived in retirement till the middle of Nero's reign, when the emperor appointed him governor of Hispania Tarraconensis, but soon after ordered him to be secretly assassinated. Galba revolted; the death of Nero followed (A.D. 68), and he himself was chosen emperor by the prætorian cohorts in Rome. He went directly to Rome, but soon made himself unpopular by cruelty and avarice, and he was slain in the Forum at the age of seventy-two.

Galen (properly Claudius Galenus) (130–200 A.D.), Greek physician. The writings attributed to Galen include eighty-three treatises acknowledged to be genuine, forty-five manifestly spurious, nineteen of doubtful genuineness, and fifteen commentaries on different works of Hippocrates, beside a large number of short pieces and fragments, probably in great part spurious. The most valuable of his works were those dealing with anatomy and physiology, and he was the first to establish the consultation of the pulse in diagnosis and prognosis. Till the middle of the sixteenth century his authority in medicine was supreme.

Gale′na, the sulphide of lead, found both in masses and crystallized in cubes, but sometimes in truncated octahedra; its color is bluish-gray, like lead, but brighter; luster metallic; texture foliated; fragments cubical; soft, but brittle; specific gravity, 7.22 to 7.759; effervesces with nitric and hydrochloric acids. For the most part it contains about 86.6 per cent. of lead and 13.4 of sulphur, generally some silver, and also antimony, zinc, iron, and bismuth. Where the proportion of silver is high it is known as *argentiferous galena*, and worked with a view to the extraction of this metal. In the U. S. it is very abundant, the deposit of galena in which the mines of Illinois are situated being the most extensive and important hitherto discovered.

Galena, Jo Daviess co., Ill., on Galena River, 165 mi. w. of Chicago. Railroads: Illinois Central, C. B. & N., C. & N. W., and Chicago Great Western. Industries: 2 shoe factories, 1 flouring mill, iron foundry, 2 breweries, sash, door, and blind, granite and marble, butter tub, and other factories, and a pork packing plant. Rich mines of lead and zinc. The town is noted as the home of General Grant. It was first settled in 1819 and became a city in 1841. Pop. 1900, 5,005.

Galesburg, Knox co., Ill., 53 mi. w.n.w. of Peoria. Railroads: A. T. & S. F., and C. B. & Q. Here are located Lombard University and Knox College. It has flour mills, foundries, engine and boiler works, broom and corn planter factories. Coal is abundant in the neighborhood. The repair shops of the C. B. & Q. railroad are here. Pop. 1900, 18,607.

Galicia, KINGDOM OF, a province of Austria, bounded by Russia, Bukowina, Hungary, and Moravia; area 30,312 sq. mi. It has several considerable rivers, those on the west being affluents of the Vistula, those in the east, of the Danube and Dniester. The climate is severe, particularly in the south, where more than one of the Carpathian summits rise beyond the snow line. The summers are very warm, but comparatively short. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, tobacco, etc. The domestic animals include great numbers of horned cattle, and a fine hardy breed of horses. Sheep are in general neglected; but goats, swine, and poultry abound, and bee-keeping is practised on a large scale. Bears and wolves are still found in the forests; and all the lesser kinds of game are in abundance. The minerals include marble, alabaster, copper, calamine, coal, iron, and rock salt. Only the last two are of much importance. Rock salt is particularly abundant. The most important mines have their central locality at Wieliczka. Distilleries exist in every quarter. The chief educational establishments are the University of Lemberg and that of Cracow. The principal towns are Lemberg, the capital, and Cracow. Galicia is now one of the Cis-Leithan provinces of the Austrian Empire. Polish is the language of official intercourse and of the higher educational institutions. Pop. 6,370,837.

Galicia, one of the old provinces of Spain, situated in the n.w., and bounded n. and w. by the Atlantic, s. by Portugal, and e. by the old provinces of Asturias and Leon. Its broken coast, which has a length of about 240 mi., lies open to the Atlantic, and there are a number of fine natural harbors, of which Ferrol is one of the finest naval ports in Europe. The chief town is Santiago de Compostella. The natives (Gallegos) speak an uncouth patois, which other Spaniards scarcely understand. The peasantry are very poor, and many leave for service in other parts of Spain. Pop. 1,881,000.

Gal′ilee, in the time of Jesus Christ, the most northern province of Palestine, bounded on the e. by the river Jordan, on the s. by Samaria, on the w. by the Mediterranean Sea and Phœnicia, and on the n. by Syria and the Mountains of Lebanon. It was in some sense the cradle of Christianity, Nazareth, Cana, Capernaum, Nain, and other places being intimately associated with the life of Christ. The inhabitants of this country, mostly poor fishermen, on account of their ignorance and simplicity of manners were despised by the Jews, who, by way of contempt, called Christians, at first, *Galileans*. At present Galilee is included in the vilayet of Syria.

Galilee, SEA OF, also called Sea of Chinnereth, or Chinneroth, and the Lake of Gennesaret, or Tiberias, a pear-shaped fresh-water lake in Central Palestine, 12½ mi. long by 7½ broad. On the east the coasts are nearly 2,000 ft. high, deeply furrowed by ravines but flat along the summit. At the time of Christ there were on its shores nine flourishing cities, of which seven are now uninhabited ruins, while Magdala and Tiberias are both in a poverty-stricken condition.

Galileo (1564–1642) (Galilei was his surname, but he is commonly known by his given name Galileo), a most distinguished Italian physicist, b. at Pisa. His father, Vencenzo Galilei, a nobleman of Florence, procured him an excellent education in literature and the arts, and in 1581 he entered the University of Pisa. At nineteen the swinging of a lamp in Pisa cathedral led him to investigate the laws of the oscillation of the pendulum, which he subsequently applied in the measurement of time; and in 1586 the works of Archimedes suggested his invention of the hydrostatic balance. He now devoted his attention exclusively to mathematics and natural science, and in 1589 was made professor of mathe-

matic at the University of Pisa. In 1592 he was appointed professor of mathematics in Padua, where he continued eighteen years, and his lectures acquired European fame. Here he made the important discovery that the spaces through which a body falls, in equal times, increase as the numbers 1, 3, 5, 7. If he did not invent, he improved the thermometer, and made some interesting observations on the magnet. To the telescope, which in Holland remained not only imperfect but useless, he gave a new importance. He noted the irregularity of the moon's surface, and taught his scholars to measure the height of its mountains by their shadow. A particular nebula he resolved into individual stars, and conjectured that the Milky Way might be resolved in the same manner. His most remarkable discovery was that of Jupiter's satellites (1610), and he observed, though imperfectly, the ring of Saturn. He also detected the sun's spots, and inferred, from their regular advance from east to west, the rotation of the sun, and the inclination of its axis to the plane of the ecliptic. In 1610 Cosmo II, grand duke of Tuscany, appointed him grand-ducal mathematician and philosopher, and with increased leisure he lived sometimes in Florence, and sometimes at the country seat of his friend Salviata, where he gained a decisive victory for the Copernican system by the discovery of the varying phases of Mercury, Venus, and Mars. In 1611 he visited Rome for the first time, where he was honorably received; but on his return to Florence he became more and more involved in controversy, which gradually took a theological turn. In 1623 Galileo replied to an attack upon him in his *Saggiatore*, a masterpiece of eloquence, which drew upon him the fury of the Jesuits. A congregation of cardinals, monks, and mathematicians, all sworn enemies of Galileo, examined his work, condemned it as highly dangerous, and summoned him before the tribunal of the Inquisition. The veteran philosopher was compelled to go to Rome early in 1633, and was condemned to renounce upon his knees the truths he had maintained. At the moment when he arose, he is said (but this is doubtful) to have exclaimed, in an undertone, stamping his foot, *E pur si muove!* (and yet it moves!). Upon this he was sentenced to the dungeons of the Inquisition for an indefinite time, and every week, for three years, was to repeat the seven penitential psalms of David. After a few days' detention his sentence of imprisonment was commuted to banishment to the villa of the Grand-duke of Tuscany at Rome, and then to the archiepiscopal palace at Sienna. He was afflicted with a disease in his eyes, one of which was wholly blind and the other almost useless, when, in 1637, he discovered the libration of the moon. Domestic troubles and disease embittered the last years of Galileo's life. He died the year Newton was born. His remains were ultimately deposited in the church of Sta. Croce, at Florence.

Galion, Crawford co., O., 60 mi. n. of Columbus. Railroads: junction of St. Louis and Cincinnati division of Big Four, and Erie. Industries: wheel co., two flouring mills, iron foundry, carriage, range, brick and tile machinery factories. Surrounding country agricultural. First settled about 1830 and became a city in 1880. Pop. 1900, 7,282.

Gall, Franz Joseph (1758–1828), the founder of phrenology, b. in Tiefenbrunn, in Baden. He studied medicine, and practised at Vienna as a physician, where he made himself known to advantage by his *Philosophisch-medicinische Untersuchungen* (1791). After a series of comparisons of the skulls both of men and animals he was led to assign the particular location of twenty organs. He accompanied Dr. Spurzheim, in 1807, to Paris, where he published with his friend, in 1810 and 1812, several books on the nervous system.

Gall, St., a northeastern frontier canton in Switzerland, abutting on Lake Constance. Its area is 780 sq. mi. Wood and good pasture are found on the mountains; on the lower slopes and valleys, vines and orchard fruits, and corn, maize, hemp, and flax are grown. The manufactures are chiefly cotton and linen goods, particularly fine muslins. The constitution is one of the most democratic in Switzerland. German is the language spoken. Pop. 210,491. St. Gall, the capital and the see of a bishop, is situated on the Steinach, 2,165 ft. above sea level. Pop. 21,438.

Gallait (gål-lā), Louis (1812–1887), Belgian historical painter. His best known works are: *Montaigne Visiting Tasso in Prison; Abdication of Charles V; The Dead Bodies of Counts Egmont and Horn; The Last Moments of Count Egmont; Alva Signing Death Warrants;* and lastly (1882), *The Plague at Tournai*, purchased for Brussels Museum at the price of $24,000.

Galland (gål-äụ), Antoine (1646–1715), a French Oriental scholar, b. in Picardy, principally known for his translation of the *Arabian Nights Entertainments* (1704–1717), the first into any European language.

Gallas, a numerous and powerful race, chiefly inhabiting a territory in East Africa, lying to the south of Abyssinia. Their color varies from a deep black to a brownish yellow; stature tall; bodies spare, wiry, and muscular; nose often straight, or even arched; lips moderate; hair often hanging over the neck in long twisted plaits. They have agreeable countenances, and are brave, but ferocious and cruel, cunning and faithless. Their language is spoken throughout a great part of Africa.

Gallatin, Albert (1761–1849), statesman, was b. in Geneva, Switzerland. Graduated at the University of Geneva in 1779. He emigrated to America in 1780. In 1789 was member of Pennsylvania State Convention. In 1793 was elected U. S. senator, and 1794 helped to suppress the "Whisky Insurrection." In 1801 was appointed secretary of the treasury, his management of which was eminently successful. In 1814 was one of the commissioners at Ghent who concluded the treaty of peace with Great Britain. In 1815 was appointed Minister to France. In 1826 was envoy extraordinary to Great Britain.

Gal'leon, formerly a kind of vessels of war, used by the Spaniards and Portuguese, with from three to four decks. In more recent times those vessels were called *galleons* in which the Spaniards transported treasure from their American colonies.

Galley, a low, flat-built vessel with one deck, and navigated with sails and oars, once commonly used in the Mediterranean. The common galleys varied from 100 to 200 ft. in length, those of smaller sizes being known respectively as half galleys and quarter galleys. They carried as many as twenty oars on each side, each oar worked by one or more men, and they had commonly two masts with lateen sails. Raised structures in the sterns, and even in the prow, were not uncommon. These, however, were more fully developed in the kind of galley known as the *galleass*, which carried three masts, from 200 to 300 rowers, and sometimes twenty guns. France formerly had a number of galleys for service in the Mediterranean, in which convicts were forced to labor. The term galley is also applied to the ships of the ancient Greeks and Romans, especially to their war ships, which were propelled chiefly by oars.

Gallfly, a name for several hymenopterous insects of the family Cynipidæ, which form the morbid products known as galls, each species seeming to be addicted to a particular plant and a particular part of the plant. The tumor or gall is due to the morbid action of an irritating fluid deposited with the egg of the insect.

Gallie'nus, P. Licinius, a Roman emperor, associated with his father Valerianus until the capture of the latter by the Persians in 260, when Gallienus continued to reign alone. His empire was limited by the revolt of most of the legions in the provinces, who chose their commanders as Cæsars, and thus gave rise to the period known as the "Time of the Thirty Tyrants." He was assassinated A. D. 268.

Gal'linule, a name for aquatic birds belonging to the family Rallidæ or rails. They are good swimmers, though they are not web-footed, but have the toes furnished with a narrow membrane. The only American species is the purple gallinule, found mainly in the Southern States, but is accidental in the Middle and Northern.

Gallip'oli, a town in European Turkey, on a peninsula of the same name at the n.e. end of the Dardanelles, 128 mi. w.s.w. of Constantinople. It was once fortified, but is now in a generally dilapidated condition, with no edifice of note except the bazaars. It has manufactures of cotton, silk, and morocco leather, and two harbors, one used as a station for the Turkish fleet, and the other for trade, chiefly in corn, wine, and oil. It was the gate by which the Turks entered Europe (1357), and in the Crimean War the allied forces landed here (1854). Pop. about 50,900.

Gallipoli Oil, a coarse olive oil used in Turkey-red dyeing and for other purposes, and prepared from olives grown in Calabria and Apulia, the latter being considered the best.

The oil is conveyed in skins to Gallipoli, where it is clarified and shipped in casks.

Gal'lium, a rare malleable metal, discovered by spectrum analysis in 1875 by De Boisbaudran in the zinc blende of Pierrefitte in the Pyrenees. It is of a grayish white color, has a brilliant lustre, and is fused by the mere warmth of the hand. In its properties it is related to aluminum.

Galls (Gall-nuts or Nut-galls), a vegetable excrescence produced by the deposit of the egg of an insect in the bark or leaves of a plant. The galls of commerce are produced by a species of *Cynips* in the tender shoots of a species of oak abundant in Asia Minor, Syria, Persia, etc. They are spherical and tubercular, and vary in magnitude from the size of a pea to that of a hazel-nut. White, green, and blue varieties are recognized, the latter kinds being the best. They are inodorous, but are strongly astringent from the tannin and gallic acid which they contain, and which are their chief products. Gall-nuts are extensively used in dyeing and in the manufacture of ink, and they are also frequently used in medicine. They are chiefly imported from Aleppo, Tripoli, and Smyrna.

Galvani, Luigi (1737–1798), Italian physician and physiologist, b. at Bologna. He practised medicine in Bologna, and was in 1762 appointed professor of anatomy at the university. He gained repute as a comparative anatomist; but his fame rests on his theory of animal electricity, enunciated in a treatise published in 1791. Twenty years before the publication of this treatise he had been making experiments on the relations of animal functions to electricity. In 1797 he was deprived of his chair for refusing to take the oath of allegiance to the Cisalpine Republic, but was restored to it in less than a year. See *Galvanic Battery.*

Galvanic Battery, a combination of galvanic cells. In a galvanic cell chemical action takes place between a liquid and a metal — usually zinc — which is partially immersed in it; and there is another metal, or solid conducting substance of some kind, also partially immersed. The zinc and the other solid conductor are called the two *plates* of the cell. The plates must not be allowed to touch each other in the liquid; but a current through an external conductor can be obtained by connecting its ends with the two plates. When this connection is made there is a complete circuit round which the current flows, its course being from the zinc plate through the liquid to the other plate, and from this latter through the external conductor to the zinc plate again. There is a continual circulation of positive electricity in this direction as long as the chemical action continues, or, what is the same thing, there is a continual circulation of negative electricity in the opposite direction. The second or inactive plate is usually either of copper, of platinum, or still more frequently of gas carbon, that is, the carbon which is deposited in the retorts at gasworks. The liquid which acts on the zinc is most frequently dilute sulphuric acid — 1 part of acid to 6 or 8 of water. In some of the best

kinds of cell there are two liquids—one in contact with the zinc and the other with the inactive plate, with a porous partition of unglazed earthenware between them.

In the simpler forms of galvanic cell there is a continual evolution of hydrogen at the inactive plate, while an equivalent quantity of oxygen enters into combination with the zinc plate, and goes to form sulphate of zinc. Some of the evolved hydrogen adheres to the copper plate and produces a rapid falling off in the electromotive force of the cell. This action, which is the principal cause of the rapid weakening of the current in batteries composed of such cells, is called *polarization*. The purpose of the two-fluid arrangement is to intercept the hydrogen and prevent it from being deposited on the copper or carbon plate. In Daniell's battery, which was the first of the kind, the hydrogen is taken up by the solution of sulphate of copper, and displaces copper, which is deposited on the copper plate. In Bunsen's it is taken up by the nitric acid, which is thus gradually converted into nitrous acid. It is used to amalgamate the zinc plates of a battery by washing them with acid, and then rubbing them with mercury. The reason for this operation is, that when ordinary commercial zinc is used without amalgamation, local currents are formed between different portions of the same plate, owing to inequalities or impurities. This *local action*, as it is called, eats away the plates without contributing to the current in the general circuit. Amalgamation renders the surface uniform and prevents this injurious action. The strength of the current given by a battery depends partly on the electromotive force of the battery and partly on its resistance.

Galvanism, the production of electricity by means of the galvanic battery. The name is derived from Galvani, professor of anatomy at Bologna, who observed that the limbs of a dead frog could be caused to move by the contact of metals. His experiments attracted the attention of Volta, professor of natural philosophy at Pavia, who shortly afterward invented the galvanic or voltaic battery.

Galvanized Iron, a name loosely given to sheets of iron coated with zinc by a nongalvanic process, the iron being first cleansed by friction and the action of dilute sulphuric acid, and then plunged into a bath composed of melted zinc and other substances, as sal-ammoniac, or mercury and potassium; more properly the name is given to sheets of iron coated first with tin by a galvanic process, and then with zinc by immersion in a bath containing fluid zinc covered with sal-ammoniac mixed with earthy matter. So long as the coating is entire, and is not exposed to corrosive substances, galvanized iron is very durable.

Galvanometer, an instrument for measuring an electric current by the deflection of a magnetic needle. The current flows through a wire coiled usually into the form of a circle, which is placed vertically in the magnet meridian and surrounds the needle. When no current is passing the needle points north and south, and the galvanometer should be so placed that the needle when so pointing lies in the plane of the coil. When a current passes through the coil, it exerts a force upon the needle tending to set it at right angles to the plane of the coil—that is, to set it east and west. The action of the earth on the other hand tends to set it north and south, and it will actually take an intermediate position which varies with the strength of the current. This position is read off on a graduated circle, usually by means of a long light pointer, which is attached to the needle at right angles. In some galvanometers, the coil can be turned till it overtakes the needle. The lower graduated circle is for the purpose of measuring the amount of this rotation.

For measuring very feeble currents, it is more usual to employ the "astatic" galvanometer. It has two needles as nearly equal as possible, fastened to one upright stem, *with their poles pointing opposite ways.* The directive actions of the earth on the two needles are opposite, and hence the resultant directive action of the earth on the two combined is very small. The coil of the galvanometer, on the other hand, is so placed that the current tends to deflect both needles the same way. The coil is approximately rectangular, its longest dimension being horizontal. One of the needles is just above, and the other is below the upper part of the coil. The current in this part of the coil would urge them opposite ways if their poles were similarly directed, but as their poles are oppositely directed it urges them the same way. The current in the lower part and ends of the coil assists in deflecting the lower needle, and is too distant from the upper needle to have much effect upon it. The coil is thus placed in a position of great advantage as compared with the earth, and the deflection is proportionately large.

Much greater sensitiveness can be obtained by the use of the mirror-galvanometer. A round box in the center contains a coil of some hundreds of convolutions, with a very small needle fastened to a little glass mirror suspended in its center by a silk fiber. Light comes through a hole and falls upon the mirror, which, being slightly concave, reflects it to a focus on the scale, where a bright image of the flame is accordingly seen. The smallest angular movement of the mirror causes a very visible movement of the bright image on the scale. The curved bar is a magnet (called the *controlling magnet*), which can be raised or lowered, and turned round. One use of it is to bring the needle into the plane of the coil when the coil is not standing north and south. It is better, however, to keep the coil north and south, and then the magnet can be used to annul the earth's magnetism, thus conferring the same advantage which is obtained by the use of two needles in the astatic galvanometer.

Galveston, Galveston co., Tex., on Gulf of Mexico and on Galveston Island, at the mouth of Galveston Bay, 450 mi. w. by s. of New Orleans. Railroads: I. & Gt. N., and Gulf Col.

& Santa Fe. Port of entry with steamship lines to Atlantic ports and to Europe. Industries: cotton presses, bagging and ice factories, cotton-seed oil and flouring mills. The city was visited by a hurricane Sept. 8, 1900, which destroyed $20,000,000 worth of property and killed over 6,000 people. Pop. 1900, 37,789.

Gal'way, a seaport of Western Ireland, prov. of Connaught, capital of county of same name, at the mouth of the Corrib, in Galway Bay, 117 mi. w. of Dublin. The chief exports are agricultural produce and marble. There are mills for sawing and polishing marble, a brewery, distillery, etc. Pop. 16,942. The county, which is washed by the Atlantic, has an area of 1,502,362 acres, of which one-eighth is under crops. In the south the country is fertile and tolerably well cultivated, producing wheat, barley, and oats. The minerals include lead, limestone, marble, and beautiful serpentine. The fisheries are valuable, but much neglected. The principal manufactures are coarse woolens and linens. Pop. 214,256.

Galway Bay, a large bay on the west coast of Ireland, between county Galway on the north and county Clare on the south, about 30 mi. in length and from 20 to 7 mi. in breadth. Across its entrance lie the Arran Islands, and there are numerous small islands in the bay.

Gama, Dom Vasco da (1450–1524), the first navigator who made the voyage to the East Indies by the Cape of Good Hope, was b. at Sines, Portugal, of a noble family. He sailed from Libson on July 8, 1497, and doubling the Cape, visited Mozambique, Mombaza, Melinda, and Calicut, returning to Libson in 1499. For this exploit he was named Admiral of the Indies and received the title of Dom, with an annual pension and extensive privileges in Indian commerce. In 1524 he was appointed viceroy of India by King John III, but his administration lasted only three months; his death taking place at Goa in the December of that year.

Gambet'ta, Leon Michel (1838–1882), a French orator and statesman, b. at Cahors of a family of Genoese extraction. In 1869, having been elected by both Paris and Marseilles, he chose to represent the southern city; and in the Chamber of Deputies showed himself an irreconcilable opponent of the empire and its measures, especially of the policy which led to the war with Prussia. The Germans having encircled Paris, he left that city in a balloon, and set up his headquarters at Tours, from which, with all the powers of a dictator, he for a short time organized a fierce but vain resistance against the invaders. After the close of the war he held office in several short-lived ministries, and in November, 1881, accepted the premiership.

Gambia, a British colony in West Africa, at the mouth of the river Gambia; area 69 sq. mi. The climate is very unhealthy in the rainy season, and there is little fertile land in the colony, but a considerable trade is done in groundnuts, hides, bees'-wax, rice, cotton, maize, ivory, ginger, gum arabic, palm oil, etc. Pop. 14,150.

Gambia, a river of West Africa, rising in a mountainous district in Futa Jallon and flowing n.w. and w. to the Atlantic; length about 1,400 mi. It is navigable for 600 mi. during seven months of the year for vessels of 150 tons, but from June to November the river becomes a torrent, rising from 20 to 50 ft. and leaving a rich alluvial deposit on its shores.

Gambier Islands, a group of small coral islands in the South Pacific, about lat. 23° 8′ s. and lon. 134° 55′ w.; belonging to France. The vegetation is luxuriant, and there are numerous birds but no indigenous quadrupeds. A French mission station formed on largest island, Mangareva, in 1834. Pop. about 2,300.

Gambir, an astringent, earthy-looking substance chiefly employed in tanning and dyeing, and obtained from East Indian trees. It is mainly imported from Singapore.

Gamboge (or Camboge), a gum-resin, used in medicine and the arts, the produce chiefly from a tree, a native of Cambodia (hence the name), Ceylon, Siam, etc. The gamboge tree attains a height of 40 ft., has smooth oval leaves, small flowers, and clusters of sweet and edible fruits. When the bark of the tree is wounded the gamboge exudes as a thick, viscid, yellow juice, which hardens by exposure to the air. When of good quality it is of a rich, orange-brown tint, and should not show a rough granular surface when broken. The finest gamboge comes from Siam. *American gamboge,* which is very similar, and is used for the same purposes, is obtained from *Vismia guianensis.* Gamboge occurs in commerce in three forms: 1, in *rolls* or *solid cylinders;* 2, in *pipes* or *hollow cylinders;* and 3, in *cakes* or *amorphous masses.* The first two kinds are the purest. Good gamboge contains about 70 per cent. of resin and 20 per cent. of gum, the remainder being made up of woody fiber, fecula, and moisture. Medicinally it acts as a violent purgative, seldom administered alone. It is employed in water-color painting, in the staining of wood, and in the formation of a golden lacquer for brass. It can be readily bruised, forming a brilliant yellow, slightly inodorous powder, and possesses a disagreeable, acrid taste.

Games, a name of certain sports or amusements carried on under regular rules and methods, as with cards or dice, billiards, tennis, etc. Among the ancients there were public games or sports, exhibited on solemn occasions, in which various kinds of contests were introduced. The Grecian games were national festivals attended by spectators and competitors from all parts of Greece, the chief being the Olympic, Pythian, Nemean, and Isthmean. They consisted of chariot races, running, wrestling, and boxing matches, etc., and to be victorious in one of these contests was esteemed one of the highest honors of a Greek citizen. The Roman games were held chiefly at the festivals of the gods. They might, however, be exhibited by private persons to please the people, as the combats of gladiators, theatrical representations, combats of wild beasts in the amphitheater, etc.

Gando, a kingdom of the Western Soudan, intersected by the Niger, and inhabited chiefly by Fellatahs, with a capital of same name. It is most fertile, and has a population of perhaps 5,000,000. Mohammedanism is the prevalent religion. The ruler is a sultan subordinate to that of Sokoto.

Ganesa (ga-nā′sa), an Indian god, the son of Siva and Párvati, represented by a figure half man, half elephant, having an elephant's head. He is the god of prudence and good luck, and is invoked at the beginning of all enterprises. There are not many temples dedicated to him, and he has no public festivals, but his image stands in almost every house.

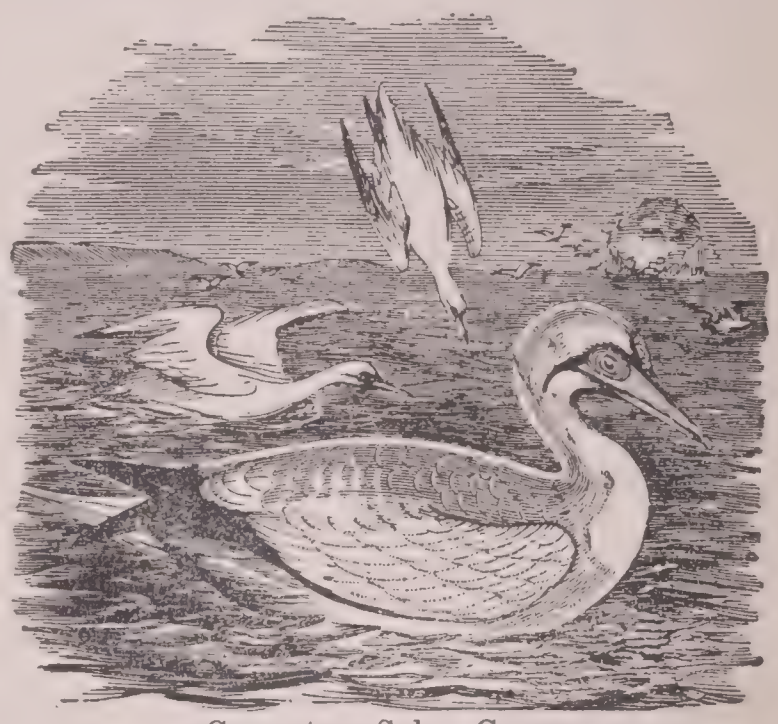
Ganges (gan′jez), a river of Hindustan, one of the greatest rivers of Asia, rising in the Himalaya Mountains, Garhwál state, and formed by the junction of two head streams, the Bhagirathi and the Alaknanda, which unite at Deoprag, 10 mi. below Srinagar, 1,500 ft. above sea level. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, rising at the height of 13,800 ft., but the Alaknanda flows farther and brings a larger volume of water to the junction. At Hardwar, about 30 mi. below Deoprag, the river fairly enters the great valley of Hindustan, and flows in a southeast direction till it discharges itself by numerous mouths into the Bay of Bengal, after a course of about 1,700 mi. In the rainy season the flat country of Bengal is overflowed to the extent of 100 mi. in breadth, the water beginning to recede after the middle of August. The Ganges delta has the Hugli on the w., the Meghna on the e., and commences about 200 mi., or 300 by the course of the river, from the sea. Some of the principal cities on the Ganges and its branches, ascending the stream, are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad, Cawnpore, and Faruckabad. The Ganges is navigable for boats of a large size nearly 1,500 mi. from its mouths, and it forms a great channel for traffic. It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days. The Hindus believe that whoever dies on its banks, and drinks of its waters before death, is exempted from the necessity of returning into this world and commencing a new life. The sick are therefore carried to the bank of the Ganges, and its water is a considerable article of commerce in the remoter parts of India.

Ganges Canal, Upper, a lateral canal in Northern India, constructed for purposes of irrigation and supplementary navigation, extending on the right of the Ganges from Hardwar to Cawnpore. The trunk of the canal measures 445 mi., and the total cost of the works has been about $14,000,000.

Gangpur′, a native state of Bengal, in Chota Magpur, consisting mainly of hills, forest, and jungle. Area 2,484 sq. mi.; pop. 107,965.

Gangrene (gang′grēn), the death of some part of a living body, wherein the tissues begin to be in a state of mortification, there being also complete insensibility. A gangrened part must be removed either by amputation or by natural process, but if a vital part is so affected death will ensue.

Gannet, the solan goose. It is about 3 ft. in length, and 6 in breadth of wings from tip to tip, the whole plumage, a dirty white, inclining to gray; the eyes, a pale yellow, surrounded with a naked skin of a fine blue color; the bill straight, 6 in. long, and furnished beneath with a kind of pouch. It is found from the Arctic Sea to the Gulf of Mexico; breeds in immense numbers on the rocky islands near the coast of Labrador. The male and female



Gannet, or Solan Goose.

are nearly alike. It makes its nests, which are composed chiefly of turf and seaweed, in the caverns and fissures of rocks, or on their ledges. The female lays only one egg, though if it be removed, she will deposit another. In St. Kilda the young form the principal food of the inhabitants, being taken by men lowered from the top of the cliffs.

Gantung Pass, a wild pass in the Western Himalayas between Bussahir in the Punjab and Thibet. It is covered with perpetual snow, and is 18,295 ft. in height.

Gan′ymede (-mēd), in Grecian mythology, great-grandson of Dardanus, the founder of Troy, and son of Tros and of Callirrhoë, daughter of Scamander. Zeus sent his eagle to carry him off from Mount Ida to Olympus, where he held the office of cup-bearer to the immortals in succession to Hebe.

Gapes, a disease of fowls and other rasorial birds, arising from the presence in the windpipe of small parasitic worms which cause the bird to continually open its beak. They may be dislodged with an oiled feather, or by mixing a little epsom salts with the food.

Gar′ancin (Garancine), the product obtained by treating pulverized madder, previously exhausted with water, with concentrated sulphuric acid at 212° and again washing with water. The residue thus obtained is found to yield better results in dyeing than madder itself.

Garcilaso de la Vega (gär-thē-lä′sō; properly

Garcias Laso de la Vega) (1500–1536), called the prince of Spanish Poets, b. at Toledo. His name is associated with that of his contemporary Boscan in the impetus given to Spanish literature by the imitation of the Italian poetic style as exemplified in Petrarch, Ariosto, and Sannazaro. His works, which consist of eclogues, epistles, odes, songs, sonnets, etc., are graceful and musical.

Garcilaso de la Vega (or Garcias Laso de la Vega) (about 1530 to about 1616), historian of Peru, surnamed the Inca, son of Garcilaso de la Vega, one of the conquerors of Peru, and a princess of the race of the Incas; b. at Cuzco, Peru. His great work on the history of Peru is in two parts; the first entitled *Los Comentarios Reales que tratan del Origen de los Incas*, etc. The second, the *Historia general del Peru*. He wrote also *Historia de la Florida*.

Gard (gär), a department of Southern France, abutting on the Gulf of Lyons; area 2,256 sq. mi. The rich lower districts produce a large quantity of wine, and are noted for silk culture. Large quantities of salt are made; and lead, coal, iron, etc., are worked. There are silk, woolen, and cotton manufactures. Nimes is the capital. Pop. 417,099.

Garda (or Bena′co), Lake the largest lake in Italy, belonging to the Alpine region, 33 mi. long n. to s., 3 to 11 mi. broad, greatest depth 902 ft., 213 ft. above sea level. It is well stocked with fish. Steamboats ply on it, and its shores are covered with villas.

Garde Nationale (nä-syo-nàl), a guard of armed citizens instituted at Paris, July 13, 1789, for the purpose of preserving order and protecting liberty. At first it numbered 48,000 men, but was increased to 300,000 when it was organized thoughout the whole country. After being alternately organized and disorganized for many years, it was finally declared dissolved by the National Assembly in 1871.

Gardiner, Stephen (1483–1555), an English prelate. Having become secretary to Wolsey and a favorite with the king, he was dispatched to Rome in 1528 to forward Henry VIII's divorce, and on his return was appointed secretary of state, and in succession archdeacon of Norwich and Leicester, and bishop of Winchester. He also went on various embassies to France and Germany.

Gardiner, Kennebec co., Me., at the head of navigation on the Kennebec River. Railroad, Maine Central. Has abundant water power, also machine shops, paper, flour and sawmills, etc. Exports: lumber and ice. Pop. 1900, 5,501.

Gardner, Worcester co., Mass., 26 mi. n. of Worcester. Railroad, Fitchburg Tunnel Line. Industries: chair and rattan furniture, two iron foundries, and about a dozen other chair factories. Surrounding country agricultural. The town was first settled in 1731 and incorporated in 1785. Pop. 1900, 10,813.

Garfield, James Abram (1831–1881), twentieth president of the U. S., was b. in Orange, O. His father, who was descended from one of the Puritan founders of Watertown, Mass.

(1630), died soon after the boy's birth, leaving his wife, the daughter of a Huguenot family that had settled in New England in 1685, to bring up unaided her four small children. At the age of ten young Garfield already added something to his mother's income by work on the neighboring farms; in winter he made steady progress in the district school. In 1849 he entered Geauga Seminary, at Chester, O.; and in the summer months he turned to any and all kinds of work, to provide funds for the ensuing winter. He next passed on to the college at Hiram, O., supporting himself meanwhile by tuition, and finally graduated at Williams College, Mass., in 1856. Returning to Hiram, he became its president in 1857, at the same time preaching and studying law. He was elected to the state senate in 1859, and on the outbreak of the war received the command of the forty-second regiment of Ohio volunteers. In December, 1861, he was given a brigade, with orders to drive the Confederates out of Eastern Kentucky, and with reinforcements gained the battle of Middle Creek Jan. 10, 1862, from which his commission as brigadier general was dated. He had been promoted major general for gallantry at Chickamauga Sept. 19, 1863, when he resigned his command to enter Congress, at the age of thirty-two. He sat in Congress, rendering valuable assistance in military and financial questions, until 1880, and acted latterly as leader of the Republican party in the House. In January, 1880, he was elected a U. S. senator, and in June of the same year he was adopted as presidential candidate by the Republican convention at Chicago. Garfield's nomination came as a surprise to his party, and was simply the result of a compromise between the supporters of Grant and Blaine, after thirty-three ineffectual ballots had proved that neither could secure the prize. He proved, nevertheless, a strong candidate, regardless of precedent delivered speeches in his own behalf, and finally defeated General Hancock by a narrow majority on the popular vote, but by 215 to 155 electoral votes. He was inaugurated on March 4, 1881, and identified himself with the cause of civil-service reform. On the morning of July 2, as he was setting off to witness the closing exercises of his old college, he was shot down from behind by a disappointed office-seeker, Charles Guiteau. For weeks he lingered between life and death; early in September he was removed to Long Branch, New Jersey, and there he died, at Elberon. He was buried at Cleveland. The vice-president, General Arthur, succeeded him. Garfield held power long enough to show himself worthy of it.

Garfish (Sea pike, or Gar pike), a fish, known also as the *sea-needle*, making its appearance a short time before the mackerel in their annual visit for spawning. It is long and slender, sometimes 2 or 3 ft. in length; the head projects forward into a very long, sharp snout; the sides and belly are of a bright silvery color, and the back green, marked with a dark purple line. A species of gar pike is common to many of our fresh-water lakes.

Garga no, a group of pine-clad mountains in South Italy, province of Foggia, forming the spur of the boot in the Italian peninsula projecting into the Adriatic. The loftiest summit is Calvo, 5,450 ft.

Gargle, a liquid application to the throat. In using a gargle the head should be thrown well back so as to keep the liquid in contact with the throat, and by expelling the air from the lungs through the liquid the passage may be thoroughly washed. Care should be taken not to swallow the gargle.

Garhwál (*gar*-hwäl′) (or Gurhwal), a district in the Northwest Provinces, India, bounded on the n. by Thibet, e. by Kumáun, s. by Bijnaur District, and w. by the Garhwal State; area 5,500 sq. mi.; pop. 345,629. There are good roads, and a considerable trade with Thibet.

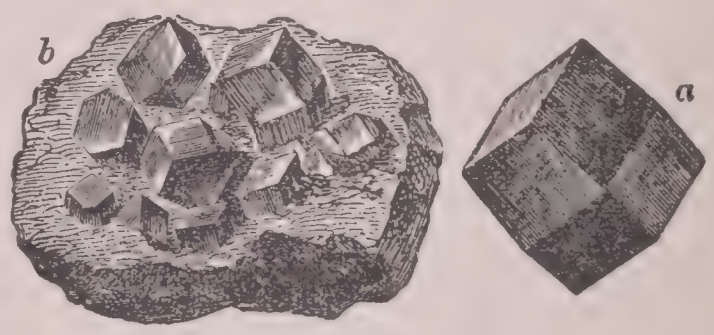
Garhwál (or Tehri), a native Indian state under British protection, w. of the district of the same name (see above); area 9,180 sq. mi.; pop. 199,836. Chief town, Tehri; chief river, the Alaknanda and other headwaters of the Ganges.

Garibal′di, GIUSEPPE (1807–1882), Italian patriot and hero, was b. at Nice, his father being a poor fisherman. He got little education, and for a number of years was a sailor on various trading vessels. In 1834 he became a member of the "Young Italy" party, and being condemned to death for his share in the schemes of Mazzini, escaped to Marseilles, took service in the fleet of the bey of Tunis, and finally went to South America. In the service of the Republic of Rio Grande against the Brazilians he became known as a brilliant leader, and with his famous Italian legion he subsequently gave the Monte Videans such effective aid against Buenos Ayres as to earn the title of "hero of Monte Video." In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians until the cessation of hostilities and re-establishment of Austrian supremacy in Lombardy. He came to the U. S., and was for some years in command of a merchant vessel. He then purchased a part of the small island of Caprera, off the north coast of Sardinia, and made this his home for the rest of his life. Latterly the subscriptions of his admirers enabled him to become owner of the whole island. In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the king of Naples, recrossed to the mainland and occupied Naples, where he was proclaimed dictator of the Two Sicilies. It was now feared that Garibaldi might prove untrue to his motto — Italy and Victor Emmanuel — but he readily acquiesced in the annexation of the Two Sicilies to Italy, and declining all honors retired to his island farm. In 1870 he gave his services to the French republican government against the Germans, and with his 20,000 men rendered valuable assistance in the southeast. At the end of the war he was elected a member of the French assembly, but speedily resigned his seat and returned to Caprera. Rome now became the capital of United Italy, and here in January, 1875, Garibaldi took his seat in the Italian parliament. The latter part of his life was spent quietly at Caprera.

Garlic, a hardy perennial allied to the onion, indigenous to the s. of Europe, and forming a favorite condiment among several nations. The leaves are grass-like, and differ from those of the common onion in not being fistulous; the stem is about 2 ft. high; the flowers are white; and the root is a compound bulb, consisting of several smaller bulbs, commonly denominated *cloves*, enveloped by a common membrane. It has a strong, penetrating odor, and a pungent acrid taste. Used as a medicine it is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific qualities, and is a good expectorant.

Common Garlic.

Garnet, a beautiful mineral, or group of minerals, classed among the gems, and occurring generally in mica slate, hornblende slate, gneiss, and granite, usually as more or less regular crystals of from twelve to sixty or even eighty-four sides. The prevailing color is red of various shades, but often brown, and sometimes green, yellow, or black. They vary considerably in composition, but admit of classification into three principal groups according to their chief sesquioxide basic components,



Garnet. *a.*—a detached crystal. *b.*—block with embedded crystals.

viz., alumina, iron, and chrome garnets. Among the varieties are common garnet, pyrope, alamandine, precious or Oriental garnet, allochroite, melanite or black garnet, etc. By jewelers garnets are classed as Syrian, Bohemian, or Cinghalese, rather, however, from their relative value and fineness than as necessarily implying that they came from these places. The first, named after Syrian, in Pegu, long the chief mart for garnets, are the most esteemed, being a violet purple unmixed with

black and taking an orange tint by artificial light. The Bohemian garnet is usually a dull poppy red with hyacinth orange tint when held between the eye and the light; the pyrope is a full crimson form of this class. Coarse garnets reduced to powder are sometimes used in place of emery for polishing metals.

Garo Hills, a district of India, forming the s.w. corner of Assam; area 3,146 sq. mi. It is a mountainous and forest region intersected by tributaries of the Brahmaputra. The native Garos are a robust and active race. Among them the wife is regarded as the head of the family, and property descends through females. Pop. 110,000.

Garonne, a river of Southwest France, rising in the vale of Aran, in the Spanish Pyrenees; length about 350 mi. It enters France and flows northwest to the Atlantic. Below Toulouse it receives, on the left, the Save, Ratz, Gers, Baise, etc.; on the right, the Tarn, the Lot, and the Dordogne, on joining which, it changes its name to the Gironde. It is navigable on the descent from St. Martory, and both ways from Toulouse. The Canal du Midi, joining it at Toulouse, forms a communication between the Atlantic and the Mediterranean at Narbonne, and the Canal Latéral, from Toulouse to Castets-en-Dorthe (Gironde), supplements its direct navigation.

Garonne, HAUTE, a department s. of France, one of the five separated by the Pyrenees from Spain. It is traversed from south to north by the higher reaches of the Garonne and for about 26 mi. by the Canal du Midi. The valleys and the lower northern districts are often of great fertility, and cereals and wine are largely exported. Hemp, flax, oranges, and tobacco are also much grown. The principal mines are lead, copper, coal, antimony, iron, and zinc, and a fine marble is quarried. There is a large transit trade with Spain. Capital of department, Toulouse. Area 2,529 sq. mi.; pop. 481,169.

Garrick, DAVID (1716–1779), actor, b. at Hereford. He had, as a child, a strong passion for acting, and in 1741 he joined Giffard's company at Ipswich, under the name of Lyddal. In 1745 he became joint manager with Mr. Sheridan of a theater in Dublin, and after a season at Covent Garden, purchased Drury Lane in conjunction with Mr. Lacy, opening it September, 1747, with the *Merchant of Venice*, to which Doctor Johnson furnished a prologue. From this period may be dated a comparative revival of Shakespeare, and a reform both in the conduct and license of the drama. He left the stage in 1776. Principal works: *The Lying Valet*, *Miss in her Teens*, and the *Clandestine Marriage*—composed jointly with Colman. He was buried with great pomp in Westminster Abbey.

Gar'rison, WILLIAM LLOYD (1805–1879), American journalist and founder of the antislavery movement in the U. S. He was apprenticed to a shoemaker, but eventually became a compositor on the *Newburyport Herald*. In 1827 he became editor of the *National Philanthropist*, the first American temperance journal, and afterward of a journal in support of the election of John Quincy Adams. With Mr. Lundy, a Quaker, he then started the paper called the *Genius of Universal Emancipation* (1829), his denunciations of slave traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, started the *Liberator* (1831), published weekly with the aid of one assistant and a negro boy. In 1832 appeared his *Thoughts on African Colonization*, and in the same year he established the American Antislavery Society. He subsequently visited England, where he was welcomed by Wilberforce, Brougham, Buxton, and others. In 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress until 1865, when the Antislavery Society was dissolved with its work accomplished. He d. at New York. A volume of sonnets and one of selections bear his name.

Garrote (går-rō'tā), a mode of punishment in Spain by strangulation, the victim being placed on a stool with a post or stake (Spanish, *garrote*) behind, to which is affixed an iron collar with a screw; this collar is made to clasp the neck of the criminal, and drawn tighter by means of the screw till life becomes extinct.

Garrya, a genus of opposite-leaved evergreen shrubs, natives of California, Mexico, Cuba, and Jamaica. *G. elliptica* is a handsome garden plant with long drooping necklace-like catkins of pale yellow flowers.

Garter, ORDER OF THE, the highest and most ancient order of knighthood in Great Britain. The origin of the order, though sometimes assigned to Richard I, is generally attributed to Edward III, the legend being that the Countess

Order of the Garter.
Star, Collar and George, and Garter.

of Salisbury having dropped her garter while dancing, the king restored it, after putting it

round his own leg, with the words which became the motto of the order, *Honi soit qui mal y pense*—"Shame be to him who thinks evil of it." The date of the foundation or restoration by Edward III of the order, as given by Froissart, is 1344, while other authorities, founding on the statutes of the order, assign it to 1350. The statutes of the order have been repeatedly revised, more particularly in the reigns of Henry V, Henry VIII, Edward VI, and George III—the last in 1805, Ladies are said to have been admitted up till the reign of Edward IV. Until the reign of Edward VI the common title of the order was the order of St. George, and it still bears this title as well as that of the Garter. The original number of knights was twenty-six, including the sovereign, who was its permanent head; and this number is still retained, except that by a statute passed in 1786 princes of the blood are admitted as supernumerary members. The peculiar emblem of the order, the garter, a dark-blue ribbon edged with gold, bearing the motto, and with a gold buckle and pendant, is worn on the left leg below the knee.

Gas, an elastic aeriform fluid, a term originally synonymous with air, but afterward restricted to such bodies as were supposed to be incapable of being reduced to a liquid or solid state. Under this supposition gas was "a term applied to all permanently elastic fluids or airs differing from common air." After the liquefaction of gases by Faraday, the old distinction between gas and vapor, viz., that the latter could be reduced to a liquid or solid condition by reduction of temperature and increase of pressure, while a gas could not be so altered, was no longer tenable, so that the term has resumed nearly its original signification, and designates any substance in an elastic aeriform state. *Gases* are distinguished from *liquids* by the name of *elastic* fluids; while liquids are termed *nonelastic*, because they have, comparatively, no elasticity. But the most prominent distinction is the following: *Liquids* are compressible to a certain degree, and expand into their former state when the pressure is removed; and in so far they are elastic, but *gases* appear to be in a continued state of compression, for when left unconfined they expand in every direction to an extent which has not hitherto been determined. In respect of this indefinite expansiveness, all gaseous bodies obey, more or less strictly, two laws, commonly called the "gaseous laws." The first, known as the law of Boyle and Mariotte, given first by Robert Boyle in 1662, and then by Mariotte in 1676, is that, *The volume of a given mass of gas varies inversely with the pressure to which the gas is subjected;* or, in other words, the *density* of a given mass of gas is in direct proportion to the pressure that the gas is subjected to. Charles's law may be stated as follows: The volume of a gas maintained under constant pressure increases for equal increments of temperature by a constant fraction of its original volume; and this fraction is the same whatever is the nature of the gas. A mass of gas, whose volume is 1,000 at 0° C., becomes, at 100° C., 1,366.5, the pressure remaining constant. In virtue of these laws a gas may now be defined to be a substance possessing the condition of perfect fluid elasticity, and presenting under a constant pressure a uniform state of expansion for equal increments of temperature—a property distinguishing it from vapor. There is, however, no known gas that obeys these two laws perfectly.

The liquefaction of gases is effected by the application of cold or pressure, or both combined. For any given pressure there is a particular temperature at which the gas liquefies. At a certain point, however, called by Andrews the *critical point of temperature*, the distinction between liquid and gas appears completely lost. At and above this temperature no pressure that can be applied will convert the fluid into the form of a liquid, even though the volume is diminished by pressure so much as to make the density of the fluid greater than that of the liquid obtained at lower temperatures. By 1878 all gases had been liquefied.

The power of motion inherent in all parts of aeriform matter is accounted for by the kinetic theory of gases, according to which a gas consists of an enormous number of molecules moving about with very great velocity. Great as is their number, however, the molecules are sparsely distributed through space, in comparison with their distribution when the substance is in the solid or liquid condition. A molecule of a gas flying about moves on in a straight line till it meets another molecule, or till it impinges on a side of the containing vessel. Meeting another molecule the two turn each other aside, just as two billiard balls when they come into collision are both deflected from their previous paths. Passing thence, each flies on in a straight line till it meets a fresh molecule, and each is again deflected. When the molecules impinge on the side of a vessel that contains the gas they rebound as a billiard ball does from the cushion of the billiard table; and the perpetual shower of molecules that strike and rebound from the sides give rise to the phenomenon of gaseous pressure, just as an umbrella held out in a hailstorm is pressed downward owing to the numerous impulsive blows that act upon it. When the temperature of a gas is raised the energy of the molecules is increased. They strike with greater velocity, and the number of blows on the surface of the vessel is also increased. The pressure is therefore greater, and the law of Dalton or Charles is easily shown to be a consequence of the kinetic theory. Boyle's law also follows very simply from it; for if we diminish the volume of the containing vessel to one half, one third, or to any other fraction of its original volume, we increase the number of molecules in a given space, a cubic inch for instance, in the same ratio. Consequently, the number of impacts on a square inch of the surface of the containing vessel will also be increased in the same ratio, and the pressure will thus be increased in that ratio too. It is estimated that in a

cubic centimeter of gas at standard temperature and pressure there are nineteen million million million molecules.

Gas, LIGHTING BY, as ordinarily understood, the application of carbureted and bicarbureted hydrogen gas, that is, *olefiant gas*, to the lighting of buildings, streets, etc. The process of making illuminating and fuel gas consists in the destructive distillation of coal, crude oil, wood, resin, fats, and other forms of hydrocarbons. The successive processes include purification of the gas to remove tar, ammonia, sulphur, and other impurities. The operations begin in the gas retort, and pass, in sequence, through the condenser, washer, purifier, and into the storage tanks, or gas holders, and thence into the mains and pipes to the consumers.

China, for ages, has used natural gas for illuminating and fuel purposes. In boring for salt, the Chinese found carbureted hydrogen, and the gas was caught and conveyed through bamboo pipes to the point of consumption. The "holy fires of Baku" on the shores of the Caspian Sea have been known for centuries. They were simply burning natural gas wells. An engineer named Murdoch of Redruth, Cornwall, England, is regarded as the pioneer gas maker, for in 1792, he erected a gas distilling apparatus, and lighted, with illuminating gas, the factory, office, and house of his employer. But before Murdoch's first attempt others had made illuminating gas. In 1766 Dr. Clayton, rector of Crofton, England, distilled illuminating gas from coal. He used it simply in a laboratory experiment. In 1750 Bishop Watson of Llandaff, distilled coal, passed gas through water, and conveyed it in pipes for a short distance. In 1786 Lord Dundonald built ovens or retorts in which he distilled coal and tar, and burned the gas produced, but he, too, regarded it simply as an interesting experiment.

Six years after his first attempt at gas making, Murdoch lighted with gas the works of Foulton and Watt, Soho, near Birmingham. In 1803 the Lyceum theater in London was lighted with gas by Winsor, who took out a patent for lighting streets with gas, and who established the first gas company. In 1807 Winsor lighted one side of Pall Mall, London, the first street lighting. Westminster bridge, London, and the Houses of Parliament were lighted with gas in 1813, and the streets of London generally in 1815. The streets of Paris were lighted with gas the same year. Balti more began using gas in 1816, Boston in 1822, and New York in 1825. After that illuminating gas became common.

In making coal gas the coal is placed in a retort, which is made of iron or clay, generally the latter. The retorts are segments of a circle, the flat side forming the floor. These are set in a brick furnace, one end of the retorts projecting beyond the front of the furnace so that they can be charged with the coal. A long scoop is used in charging. It is handled by three men, who are able to charge fifteen retorts, each holding 220 pounds of coal, in fifteen minutes. When full of coal the mouth of the retort is closed and luted (made gas-tight with moist fire clay) to prevent the escape of gas. The charge remains five hours in the retort, subjected to the heat of the furnace. The coal expands to twice its bulk and forms coke, and the gas passes up and out of the retort through a pipe which is connected with each retort.

The branch pipe from the retort is connected with a main pipe, which conducts the gas, with its accompanying vapors, to the condenser. The condenser is a series of upright pipes or of convulated pipes, in which the gas is cooled, and the tar precipitated. After losing its tar, the gas is conducted to the washer, where it comes in contact with water. The ammonia in the "crude" gas has such great affinity for water that it leaves the gas and takes to the water. The gas, with the tar and water removed, next passes to the purifier, where it comes in intimate contact with moist, powdered lime, which is spread on shelves, or tiers in a box. The lime absorbs the sulphur, and the purified gas passes on into the gas holder. The gas is moved forward in its progress by means of an exhaust fan, otherwise there would be back pressure which would lead to explosions and retard the making of the gas.

A gas holder is a large, vertical, open-bottomed tank or cylinder, some of them having a storage capacity of 3,000,000 cubic ft. of gas. The cylinder or upper tank is placed over a tank filled with water. Gas holders are made of iron or steel plates daubed inside and outside with tar to prevent leakage. The movable or upper part of the holder is partly counterbalanced with weights, and sometimes it is so exactly balanced that extra weights are placed on it to give the pressure necessary to force the gas through the mains. The holder, when filled with gas, ascends; when emptied, descends, the lower edge, however, is always submerged in the water to prevent the escape of the gas. The gas is led into the holder through a pipe, and another pipe permits it to pass into the main. Valves regulate the inlet and outlet. The surface of the water is covered with tar in the space between the outside of the holder and the inside of the tank, to prevent the water from freezing.

To govern the flow of the gas, and to give it a uniform pressure, an automatic governor or regulator is used. The gas passes through this regulator before reaching the street mains. Various forms of regulators are used. In one, a cup with a notched rim is inverted over the top of an inlet pipe. The edges of the cup dip into mercury. An increase of pressure from the gas holder operates on a diaphragm in such a manner that the edge of the inverted cup is dipped farther into the mercury, causing a depression of the notched edges, thus reducing the area of the outlet for the gas. A decrease in the pressure has the opposite effect, and enlarges the area of opening, thus permiting more gas to pass through. Another form of regulator has an inverted cylinder, which is

partially balanced by a weight. A cone, with the small end passing up through the mouth of the inlet pipe, is connected with this miniature gas holder. An increase of pressure from the gas holder causes the inverted cylinder, whose lower edge is submerged in water, to rise. This draws up the cone valve, and reduces the opening of the inlet pipe, reducing the flow of gas. A decrease in pressure causes the inverted cylinder to fall, letting the cone down into the inlet pipe, enlarging the opening, and permitting more gas to escape. All regulators are operated on the principle that an increase of flow causes a diaphragm, cylinder, or bell top to rise, reducing the area of the opening, and a decrease in pressure has the opposite effect. Some of the regulators or governors are extremely sensitive, and maintain a remarkably uniform pressure.

The gas after passing through the regulator or governor, reaches the street mains, and from them the consumer. In order that gas companies may know the number of cubic feet of gas consumed, the gas is passed through a gas meter before it enters the house pipes. A wet gas meter consists of an outer box, partially filled with water, glycerine, or alcohol, to a level just above the center line of the box. Within the box is a series of buckets, arranged around a shaft. Each bucket has a known cubical capacity. The gas enters below a bucket, filling it, and causing it to rise in the liquid. The pressure of the gas causes a continual rotation of the buckets, while gas is being consumed, and the rotations are registered by a suitable mechanism. The dry gas meter consists of a pair of bellows, each of a known cubical capacity. The gas under pressure fills one set of bellows, while the other is being emptied. The alternate filling and emptying is registered by suitable mechanism. Another form of dry meter consists of a cylinder with a reciprocating piston. The pressure of the gas moves the piston, and the gas is measured by the number of strokes the piston makes.

The gas burner is the jet piece at which the gas issues and where it is lighted. It consists of a slit or a number of small holes so arranged that the gas issues in a flat sheet, in separate jets, or in a hollow cylinder of flame. A modern improvement in gas burners is the incandescent light. This is a meshed cap of some substance which is made incandescent by heat. It gives a strong, steady, white light, similar to the electric incandescent light.

Water Gas.—In 1793 Lavoisier discovered that when steam, unmixed with air, is passed through glowing coke, the coke is oxidized; carbonic oxide and hydrogen gas are produced, theoretically pure and in equal volumes; practically, the product contains 3 to 7 per cent. of carbonic acid, and 4 to 9 of nitrogen. The yield is from coke (7,000,000 calories per ton) about 35,000 cu. ft., with a heating value of about 75,000 calories per 1,000 cu. ft., or on the whole about 40 per cent. of the heat-value of the coke; from coal (7,800,000 calories per ton) about 42,000 cu. ft. at

92,000 calories, or about 49 per cent. In the process the steam cools down the glowing coke; consequently air must be sent through the coke at intervals (about 4 minutes steam and 10 minutes air) in order to restore its glow; and a series of producers must be so conjoined as to act alternately with one another, before the process can result in a continuous supply of water gas. Water gas is much used in the U. S. It is supplied to houses, either pure or mixed with the coal gas produced in the manufacture of the coke from which the water gas is made, and it is then known as a "fuel gas;" but more generally it is carbureted by being exposed to a high temperature along with naphtha or petroleum vapors, and the resultant mixture is employed as illuminating gas. Unfortunately the high percentage of carbonic oxide, which is odorless, has caused the death roll due to water gas to be a very high one in America. In New York, Brooklyn, and Baltimore the average yearly number of deaths from gas-poisoning before water gas came in was 1.2; since then it has been 16, even though in these towns the gas is provided with a heavy carbureted smell.

Gas for Car Lighting.—Pintsch gas is made wholly from crude petroleum. This petroleum is pumped into a small storage reservoir in the retort room of the gas works. This room is like a great oven with a cinder floor and is almost as hot. Here are a number of furnaces, each furnace having a double retort of iron set in a solid wall of fire clay. Above are the large chimneys which furnish the necessary draft to keep the fire roaring. From the storage tank the oil flows to the upper retort into which it drips through a micrometer cock and funnel. The bottom of the upper retort is filled by an iron pan which is heated to a very high temperature. When the oil strikes this pan it is instantly vaporized and in that form passes down through the connecting headpiece to the lower retort where a much greater degree of heat brings it to the condition of fixed gas. About every ten minutes the gas is tested to see if it has reached the proper consistency. The gas is now of a rich yellow color, heavily loaded with tar, carbon, and sulphur. A gallon of oil will yield about 75 ft., and each of the retorts will make about 300 cu. ft. of gas an hour. From the retort the gas passes down through a water seal to a pipe which leads to the condensing room. Here it passes through a huge tubular boiler with cold water flowing around the pipes. On cooling the gas deposits a large proportion of the tar which it contains. The gas goes from the condenser through a washer to two purifiers, which are built like ordinary paper boxes, except that the cover sits inside of the bottom portion instead of the outside. In these boxes are layers of shavings and sawdust surmounted by oxide of iron. The gas in passing through first one and then another is relieved of the remaining tar, and the oxide of iron takes up the sulphur. The gas, now pure and clean, passes through a meter which measures it, and is carried to strong storage

tank such as is used for city gas. From here it is pumped back as required through an empty boiler or freezer which removes all moisture into the compressing pumps. When it has been compressed from twelve to fifteen atmospheres, it is passed downward into strong iron pots where the hydrocarbons, which are the result of compression, are drained away. The gas is then pumped into storage tanks where it is kept until wanted for use. From the storage tanks the gas is piped to the various railroad depots where it is drawn and supplied to the long iron receivers, resembling elongated steam boilers under the cars. The gas goes through an automatic regulator which expands it until the pressure is only a few ounces to the square inch before it goes to the lamps. Some cars have a device by which the gas is extinguished as soon as there is an accident.

Gascoigne (-koin′), GEORGE (1535–1577), English poet, educated at Cambridge, admitted to Gray's Inn in 1555. Being disinherited by his father, he served with distinction in Holland and was made prisoner by the Spaniards, but returned safely to England and died at Stamford. He is chiefly remembered for his blank verse satire, *The Steele Glas* (1576), and the *Complaynt of Philomene*, a rhyming elegy (1576), but he wrote two or three comedies and tragedies.

Gas′cony, an old division of France, between the Garonne, the sea, and the Pyrenees. It composes the departments of Hautes Pyrénées, Gers, and Landes, with part of those of Bas Pyrénées, Haute Garonne, Lot-et-Garonne, and Tarn-et-Garonne. The Gascons, who are of mixed Basque and Gothic descent, used to have the character of being brave, faithful, and peculiarly tenacious of purpose, but much given to boasting, whence the word *gasconnade.*

Gas Engine, an engine in which the movement of the piston is caused by the explosive energy of a mixture of inflammable gas with atmospheric air. After various attempts by Huyghens, Pepin, and others to utilize explosive agents like gunpowder in working machines, a French artisan, Lebon, patented in 1799 an engine in which energy was obtained by exploding charges of coal gas mixed with air on each side of the piston alternately, the explosion being effected by an electric spark. Modifications of this engine were patented by Lenoir in 1860, by Hugon, and by Messrs. Siemens. The most satisfactory are probably those known as Brayton's High-pressure Gas Engine, and Otto's Gas Engine. The latter consists of an upright cylinder in which works a heavy piston, the rod of which forms a rack gearing with a cogwheel on the shaft of the fly wheel. As the piston ascends the cogwheel slips loosely on the shaft; as it descends its energy is transferred to the shaft through the cogwheel, the force of the down stroke being due to the rapid condensation of the gases after the explosion aided by the weight of the piston itself. The mixed gases — coal gas and air — are introduced at the base of the cylinder and fired, as in Hugon's patent, by communicating with a gas jet kept constantly burning. The great objection to this engine — its noise in working — has been overcome in the Otto Silent Gas Engine, in which the working cylinder is horizontal and considerably shorter than in the old form.

Gas′kell, ELIZABETH CLEGHORN (1810–1865), novelist, daughter of William Stevenson, editor of *Scott's Magazine*; b. at Chelsea. Married in 1832 the Rev. William Gaskell, a Unitarian minister at Manchester. Principal works: *Mary Burton, Right at Last, Wives and Daughters*, and *The Life of Charlotte Bronté.*

Gaspé, a district of Canada, prov. Quebec, on the s. of the St. Lawrence estuary, and washed by the Gulf of St. Lawrence, of which Gaspé Bay is an inlet. The fisheries are valuable; Gaspé Basin is a port on Gaspé Bay.

Gastein (or Wildbad Gastein), a watering-place in Austria, 3,000 ft. above the sea, 48 mi. s. of Salzburg, with thermal springs (64° to 100°) containing salts and carbonate of magnesia and lime. It gives the name to a treaty signed here in 1865 by the emperor of Austria and the king of Prussia, the non-observance of which led to the German war of 1866.

Gas′teropods, a class of molluscs, consisting of animals inhabiting a univalve shell, although some of the group are wholly destitute of a shell. The shell is either a small internal plate, as in slugs; or cone-shaped and spiral, as in the majority; or multivalve, the pieces following each other along the middle line, as in the chitons. No known gasteropod has a bivalve shell. The distinguishing characteristic is the foot, which is broad, muscular, and disc-like, and attached to the ventral surface.

Gastric Juice, a clear, colorless fluid with a saline taste and sour odor secreted by the mucus membrane of the stomach, and chief agent in the process of digestion. It is acid, and contains pepsin, its essential nitrogenous principle. The activity of the fluid has been ascribed to various acids present,—lactic, acetic, and butyric; but it appears that free hydrochloric acid is that which is secreted by the stomach, the others being the products of change of food undergoing digestion. The acid is necessary for the pepsin to exercise its properties, which are limited to the conversion of nitrogenous substances into *peptones*, fatty matters not being affected by it. Gastric juice also holds in solution various inorganic salts, chiefly chlorides and phosphates, occasionally also abnormal substances such as urea, ammonia, salts, and biliary acids. It is not possessed of any marked reactions with ordinary chemical reagents, does not become turbid by boiling, and gives no striking precipitates with acids, alkalies, or mineral salts. The amount secreted daily in the human adult is estimated to be about 14 pounds, but as it is continually re-absorbed, there is no great quantity present at any one time.

Gastros′tomy, the operation of forming an artificial opening into the stomach with the view of introducing food when it cannot be

received naturally on account of obstruction or stricture of the gullet. The operation, when it is not delayed too long, has proved successful in a fair proportion of cases.

Gates, Horatio (1728–1806), an American officer during the Revolutionary War, b. in England. He rose to the rank of major by merit alone. At the capture of Martinique he was aide-de-camp to General Monkton, and was with Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, on which he resided until the Revolutionary War in 1775, when he was appointed adjutant general by Congress, with the rank of brigadier. At the head of the American army of the north he compelled the British general Burgoyne to surrender his whole army at Saratoga (1777). In 1780, after the capture of General Lincoln, Gates received the chief command of the southern districts, but was defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court martial, but was finally acquitted, and reinstated in his command in 1782 after the capture of Cornwallis. He then retired to Virginia, and in 1790, having emancipated all his slaves, he removed to New York, where he died.

Gateshead, parliamentary and municipal borough, England, opposite Newcastle, of which it is practically part. The industrial establishments include works where heavy articles in iron, such as girders, anchors, and chain cables, as well as engines, etc., are made; shipbuilding yards, roperies, brass, copper, and iron foundries; paper, glue, vinegar, glass, artificial manure, and large chemical works. Pop. 85,708.

Gath (Hebrew, "wine-press"), one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael, and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Sâfieh, between Ekron and Ashdod.

Gatineau (gat-i-nō′), a river of Canada, Quebec province, the largest affluent of the Ottawa, rising in some lakes, and flowing almost due s. to enter the Ottawa nearly opposite Ottawa City. It is not navigable more than five miles above the Ottawa except by canoes, but its rapid waters are well stocked with fish, and available as water power. The country through which it flows is, however, only partially settled.

Gauchos (gow′chōz), natives of the Pampas of the La Plata countries in South America, of Spanish descent. They are noted for their spirit of wild independence, for horsemanship, and the use of the lasso. Their mode of life is rude and uncivilized, and they depend for subsistence chiefly on cattle raising.

Gauge (or Gage), Steam and Water, the instruments fixed to engine boilers for registering the force of steam and the level of the water.

The first often consists of a siphon tube, with equal legs, half filled with mercury. One end is fastened into a pipe, which enters that part of the boiler which contains the steam; the other end is open to the atmosphere. The steam, acting on the mercury in one leg of the gauge, presses it down, and the mercury in the other leg rises, the difference between the two columns being the height of mercury which corresponds to the excess of the pressure of the steam in the boiler above the pressure of the atmosphere; or, in other words, to the effective pressure on the safety valve. For high-pressure engines the steam gauge usually consists of a spiral tube into which the steam is admitted, and which becomes less bent the greater the pressure. The water gauge is a vertical glass tube, or flat case, communicating above and below with the boiler. Gauge cocks are sometimes put instead of or in addition to the tubes, for enabling the engineer to verify the level of the water.

Gaul (Gallia), in ancient geography the country of the Gauls, the chief branch of the great original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Latterly the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Cæsar, about the middle of the first century B. C., found Transalpine Gaul divided into three parts: 1, Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; 2, Celtic Gaul, from the Garonne to the Seine and Marne; 3, Belgic Gaul, in the north, extending to the Rhine.

Migrations among the Gauls about 397 B. C., and their passage of the Alps, first bring the Gallic nation into the region of history. Having crossed the Alps they fell upon the Etruscans, defeated the Romans at Allia (390 B. C.), and sacked and burned Rome, the capitol, however, being saved by Camillus. More than a century after the burning of Rome, the eastern Gauls, in 280–278 B. C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name *Galatians*, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube and in the south of Germany disappear. Tribes of German origin occupied the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the northern part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from whence colonists passed over into Britain, and settled on the coast districts. The Celts of Cisalpine Gaul continued formidable to Rome until after the first Punic War, when the nation was compelled as the result of a war of six years to submit to the Romans, 220 B.C. When Hannibal marched on Rome they attempted to

shake off the yoke; but the Romans, victorious over the Carthaginians, reduced them again to submission. In the years 128–122 B. C. the Romans conquered the southern part of Gaul along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province (Provincia), a name that still exists as Provence. Not long after Gaulish tribes shared in the destructive incursions of the Cimbri and Teutones on the Roman territory, which were ended by Marius in the battles of Aquæ Sextiæ (Aix) in 102, and Vercelli in 101 B. C. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years, 58–50 B.C., in eight bloody campaigns.

Gaur (Gour), one of the largest of all the ox tribe, inhabiting the mountain jungles of India, remarkable for the extraordinary elevation of its spinal ridge, the absence of a dewlap, and its white "stockings," which reach above the knee. It is so fierce when aroused that neither tiger, rhinoceros, nor elephant dare attack it. The hide on the shoulders and hind quarters is sometimes nearly two inches in thickness even after being dried, and is therefore much valued for the purpose of being manufactured into shields. The animal is supposed to be incapable of domestication.

Gauss (gous), KARL FRIEDRICH (1777–1855), a German mathematician. In 1801 he published his *Disquisitiones Arithmeticæ*, treating of intermediate analysis or transcendental arithmetic, and containing, in addition to many new theorems, a demonstration of the theorem of Fermat concerning triangular numbers. He invented the helitrope and a magnetometer for ascertaining the variations of the magnetic needle; also calculated, by a new method, the orbit of the planets Ceres and Pallas. His works mark an era in the history of science. He was pronounced by Laplace to be the greatest mathematician in Europe.

Gautier (gō-ti-ā), THEOPHILE (1811–1872), French poet and critic. His first great success was the romance *Mademoiselle de Maupin*, which led to his engagement by Balzac as secretary. He afterward engaged as theatrical and art critic on the *Revue de Paris*, the *Artiste*, the *Moniteur*, and the *Journal Officiel*. Among the most interesting of his productions may be ranked his *Voyages en Espagne* (1843), his *Italia* (1852), and *Constantinople* (1854) narratives of his travels; his *Roman de la Momie* (1856), *Le Capitaine Francaise* (1863), *Belle Jenny* (1865), novels, together with the brilliant short stories, *Fortunio*, *Une Nuit de Cléopâtre Jean et Jeanette*, etc., and his *Histoire de l'Art Dramatique en France Depuis Vingt-cinq Ans* (1849), *Les Beaux Arts en Europe* (1852), etc.

Gavar'ni, the assumed name of SULPICE PAUL CHEVALIER (1801–1866), French caricaturist, b. at Paris. His best-known works are *Les Enfants Terribles*, *Les Rêves*, *Les Fourberies de Femmes*, and *Impressions de Menages*. In 1847 he visited England, and the sketches which he sent from St. Giles, London, to *L'Illustration* created an immense sensation. He afterward illustrated Eugene Sue's *Wandering Jew*, Balzac's novels, and other works.

Ga'vial, the Indian crocodile, characterized by the narrow, almost cylindrical jaws which form an exceedingly elongated muzzle. The teeth (about 120 in number) are of equal length, and the feet are completely webbed. The

Gavial.

males can be distinguished from the females by the shape of the muzzle, which is much smaller at the extremity. The only extant species occurs in South and Eastern Asia, especially in the Ganges. It feeds on fishes and small prey.

Gavotte', an air for a dance with two strains, each of four or eight bars, in $\frac{2}{4}$ or $\frac{4}{4}$ time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into suites, sonatas, etc. The name is said to be derived from the Gavots, the inhabitants of the Gap, in France.

Gay, JOHN (1688–1732), English poet, b. near Barnstaple, and apprenticed to a silk mercer in London. In 1711 he published his *Rural Sports*, and, in 1712, his mock-heroic poem, *Trivia, or the Art of Walking the Streets of London*. In 1715 appeared his burlesque drama of *What d'ye Call It?* but his next piece, the farce, *Three Hours after Marriage*, altogether failed. In 1720 he published his poems by subscription, in 1723 his tragedy, *The Captives*, and in 1726 his well-known *Fables*. His *Beggar's Opera*, the notion of which seems to have been afforded by Swift, was first acted in 1727, at Lincoln's Inn Fields, where it ran for sixty-three nights, but the lord-chamberlain refused to license for performance a second part entitled *Polly*.

Gay, MARIE-FRANCOISE-SOPHIE (1776–1852), French authoress, b. at Paris; maiden name, Nichault de Lavalette. Her salon was a famous resort for the men of letters and artists of the time. Her chief works are *Laure d'Estell* (1802), *Anatole* (1815), *Le Moquer Amoureuse* (1830), *Scènes de Jeunes Ages* (1833), *La Duchesse de Châteauroux* (1834), *Les Salons Cèlébres* (1837), and *Le Mari Confident* (1849).

Gayá, the chief town of a district of the

same name in Bengal, on the right bank of the Phalgu, a tributary of the Ganges, 260 mi. n.w. of Calcutta. The place abounds with objects of Hindu worship, and almost every height in the vicinity is the subject of a legend. Pop. 76,415. The district has an area of 4,712 sq. mi.; and pop. 2,124,682.

Gaza, an ancient town of Syria, originally a city of the Philistines, near the Mediterranean, 50 mi. s.s.w. of Jerusalem. The modern town, Ghuzzeh, is a principal entrepôt for the caravans passing between Egypt and Syria. Pop. about 15,000.

Gazelle′, the type of a sub-family of antelopes, which includes some twenty-three species of small, mostly desert-loving forms. Its color is a light fawn upon the back, deepening into

Gazella Granti.

dark brown in a wide band which edges the flanks and forms a line of demarcation between the color of the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft, and lustrous. Both sexes are provided with horns, round, black, and lyrated, about 13 in. long. It seems to be confined to the n. side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia, and South Persia.

Gazette′ (from *gazzetta*, a small Venetian coin, which was the price of the first newspaper), a newspaper, especially an official newspaper. The first gazette in England was published at Oxford in 1665. On the removal of the court to London the title of *London Gazette* was adopted. It is now the official newspaper, and published on Tuesdays and Fridays. It is the organ by means of which all state intelligence, proclamations, appointments, etc., are promulgated, and in which declarations of insolvency are published. A similar official newspaper is published also in Edinburgh and Dublin.

Gaz′ogene, an apparatus used for manufacturing aerated water on a small scale for domestic use, by the combination of an alkali and an acid, as carbonate of soda and tartaric acid, which yield carbonic acid when mixed with water. It generally consists of two globes, one above the other, connected by a tube, the

lower for containing water, and the upper the ingredients for producing the gas. The vessel is made air-tight by means of a screw top, and when water is gently introduced into the upper globe from the lower, by inclining the vessel so as to fill about a half of the former, chemical action takes place, and the carbonic acid evolved gradually saturates the water in the lower globe. When this has taken place, the aerated water can be drawn off by opening a stop-cock at the top attached to a second tube which reaches almost to the bottom of the lower globe.

Gearing, in machinery, the parts collectively by which motion communicated to one portion of a machine is transmitted to another, generally a train of toothed wheels. There are two chief sorts of wheel gearing, viz., *spur gearing* and *beveled gearing*. In the former the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In *beveled gearing* the teeth are placed upon a beveled surface round a wheel which if the slope of the bevel were continued would form a cone, the teeth sloping similarly.

Gebang Palm, a fan-leaved palm of Southeastern Asia. Its pith furnishes a sort of sago; its leaves are used for thatch, and made into hats, baskets, and bags; the fibers of its leafstalks are made into ropes, nets, cloth, etc., and the root is highly medicinal.

Geber (gē′bėr), Arabian chemist or alchemist, often designated the father of chemistry, flourished during the eighth century. He was acquainted with nearly all the chemical processes in use down to the eighteenth century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes; the purification, composition, and properties of the metals then known,—gold, silver, copper, lead, tin, and iron,—and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works, as well on metaphysics, language, astronomy, etc., as on chemistry.

Gecko, a name common to the members of a family of nocturnal lizards, characterized by

Fringed Gecko.

the general flatness of their form, especially of the head, which is somewhat of a triangular shape; the body is covered on the upper part with numerous round prominences or warts; the feet are rather short, and the toes of nearly equal length and furnished with flattened sucking pads by means of which the animals can run up a perpendicular wall, or even across a ceiling. One species is common in North Africa and South Europe.

Ged, WILLIAM (about 1700–1749), inventor of stereotyping, b. in Edinburgh. He first practised his great improvement in the art of printing in 1725; and some years later he entered into partnership in London, the result of which was the production of two prayer books only. He returned to Scotland in 1733, and published a stereotype edition of Sallust.

Gefle (yef'le), a seaport, Sweden, near the mouth of a river of same name in the Gulf of Bothnia, 50 mi. n. of Upsala. It stands on both sides of the river and two islands formed by it, and has an excellent harbor. It has manufactures of linen, leather, tobacco, sail cloth, etc.; shipbuilding yards; and an extensive trade in deals, tar, pitch, iron, etc. Pop. 20,753.

Geibel (gī'bl), EMANUEL (1815–1884), German poet, b. at Lübeck. He studied at the universities of Bonn and Berlin, and resided a year or two in Greece. He published his first collection of poems in 1840, which reached its hundredth edition in 1884. In 1843 he published a tragedy, *King Roderick;* in 1846 the epic *König Sigurd's Brautfahrt.* A second collection of his poems appeared in 1848—*Juniuslieder* (June songs). A third collection of poems was published by him in 1857, a fourth in 1864. From 1851 to 1869 he was honorary professor of æsthetics and poetry in the University of Munich, but spent his latter days in his native town. He wrote also *Brunhild,* a tragedy; *The Loreley,* an opera in rhyme; and several other plays, but his fame rests on his lyrics, which are immensely popular.

Geissler Tubes (gīs'lėr) (also called "vacuum tubes"), from the manufacturer's name, — a philosophical instrument maker of Bonn,— tubes made of very hard glass, and containing highly rarefied gases (air, oxygen, nitrogen, etc.). Each end of the tube has a platinum wire sealed into it to serve as electrodes. When a discharge of electricity is caused to take place in these tubes by connecting the electrodes to the terminals of a Ruhmkorff's coil or a Holtz's machine, very brilliant effects may be produced.

Gela (jē'la), one of the most important ancient Greek cities of Sicily, situated on the south coast of the island between Agrigentum and Camarina; founded in 690 B.C. by a colony of Cretans and Rhodians. The colony was remarkably prosperous, and in 582 B.C. sent out a portion of its inhabitants, who founded Agrigentum. In 280 Phintias, the tyrant of Agrigentum, utterly destroyed Gela. Its site has been the subject of much controversy.

Gelatin (jel'a-tin), a concrete animal substance, transparent, and soluble slowly in cold water, but rapidly in warm water. It is confined to the solid parts of the body, such as tendons, ligaments, cartilages, and bones, and exists nearly pure in the skin, but it is not contained in any healthy animal fluid. Its leading character is the formation of a tremulous jelly when its solution in boiling water cools. Gelatin does not exist as such in the animal tissues, but is formed by the action of boiling water. The coarser forms of gelatin from hoofs, hides, etc., are called *glue;* that from skin and finer membranes is called *size;* and the purest gelatin, from the air-bladders and other membranes of fish, is called *isinglass.* With tannin a yellowish white precipitate is thrown down from a solution of gelatin, which forms an elastic adhesive mass, not unlike vegetable gluten, and is a compound of tannin and gelatin. It is this action of tannin on gelatin that is the foundation of the art of tanning leather. Gelatin when acted upon by sulphuric acid yields gelatin sugar or glycocoll. When treated with potash it is said to yield glycocoll and leucin. It is a nutritious article of food, and as part of the diet in hospitals produces the best effects; but animals fed exclusively on it die with the symptoms of starvation, as it cannot yield albumen, fibrin, or casein. Its ultimate components are 47.8 carbon, hydrogen, 16.9 nitrogen, 27.4 oxygen.

Gelderland (Guelderland) (gel'-), a province of the Netherlands; area 1,963 English sq. mi. The manufactures, principally woolen, cotton, and linen goods, soap, salt, and glass, are carried on extensively in various quarters. Pop. 496,538.

Gelon (jē'lon), an ancient Greek ruler, tyrant of Gela, and afterward of Syracuse. After the death of Hippocrates, tyrant of Gela, he seized the sovereign power (B. C. 491), and about 485 B. C. gained possession of Syracuse. His aid was sought by the Greeks against Xerxes, but a formidable invasion of Carthaginians under Hamilcar engaged him in Sicily. The result was the total defeat of the Carthaginians in the great battle of Himera (B. C. 480). It is celebrated in an ode by Pindar. Gelon d. in 478 B. C., and was succeeded by his brother Hieron.

Gelse'mium, a genus of plants belonging to the nat. order Loganiaceæ, the best known, the Carolina jasmine, being an evergreen climbing shrub of the Southern states, with twigs producing a milky juice, opposite lance-shaped, shining leaves, and sweet-scented, yellow flowers. The root has valuable medicinal properties, being used for controlling certain forms of nervous irritability.

Gemara (ge-mä'ra), in Jewish literature the second part of the Talmud or commentary on the Mishna.

Gemini (jem'i-nī), the Twins (II), the third sign of the zodiac, so named from its two brightest stars, Castor, of the first magnitude, farthest to the west, and Pollux, of the second, farthest to the east. Its constituent stars form a binary system revolving in about 250 years. The sun is in Gemini from about the 21st of May till about the 21st of June, the longest day.

Gems, or precious stones, are sometimes found crystallized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. The first and most valuable class of gems includes diamonds, emeralds, rubies, sapphires, and a few others; the second class includes the amethyst, topaz, garnet, etc.; while agate, lapis-lazuli, cornelian, etc., though much used for ornament, can scarcely be called gems. The various precious stones are described under their proper heads. The fabrication of artificial gems is now prosecuted with skill and capital, and has become an important industrial art. The base of one class of imitations is a peculiar kind of glass of considerable hardness, brilliancy, and refractive power, called *paste* or *strass*, which is distinguished from ordinary glass by the presence of 50 per cent. of oxide of lead among its constituents. When the strass is obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colors. Another class, called semi-stones or doublets, are made by affixing thin slices of real gem to an under part of strass by means of an invisible cement. In some cases an imitation is made by setting uncolored strass or quartz in jewelry with some colored "foil" at the back of it. Attempts have within recent years been made with a fair measure of success to manufacture true gems by artificial processes. The French chemists Becquerel, Ebelman, Gaudin, Despretz, and others have done much in this direction. In 1858 MM. Deville and Caron communicated to the Academy of Sciences, Paris, a process for the production of a number of gems of the corundum class, as rubies, sapphires, etc. The process essentially consisted in exposing the fluoride of aluminum, together with a little charcoal and boracic acid, in a plumbago crucible protected from the action of the air, to a white heat for about an hour. Many experiments with a view to producing diamonds artificially have also been made. From hydrocarbons, subjected to a very intense heat and enormous pressure, minute fragments of crystalline carbon, differing from natural diamonds in no respect save brilliancy, have been produced. In art and archæology the term gem is usually applied to a precious stone cut or engraved in ornamental designs, or with inscriptions. Stones on which the design is raised above the general surface are called *cameos;* those having the design sunk below the surface are called *intaglios.* Early specimens of cut gems are seen in the scarabæi, or beetle-shaped, signets worn in rings by the ancient Egyptians. Among the Greeks, Etruscans, and Romans gem sculpture held a high place, reaching its highest point under Augustus. Modern gem engraving dates from the beginning of the fifteenth century, the chief seats of the art being Italy and Germany. Rome is now the headquarters of the seal engraving art. The tools of the engraver consist of a lathe, and a series of little rods with heads of different shapes, all of which can be adjusted to the lathe. The axis of the lathe is pierced at the center with an orifice, into which the tools for cutting the stone are firmly fixed by means of a screw. The engraver wets the extremity of the mounted rod with diamond dust made into a paste with olive oil, and as the wheel is in motion he applies the stone, firmly cemented to a piece of reed, to the revolving tool. The diamond dust enables the tool to cut into the stone with ease. As the design is frequently very elaborate and of the greatest delicacy, the tools are necessarily multiform. The stones used for cameo cutting often exhibit layers of different colors, so that the raised design has a tint distinct from the ground. Intaglios are very often executed in transparent stones, and the subjects treated in this manner are more limited in number.

Gendarmes (zhän′dârm), the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy armed cavalry, which composed the chief strength of the forces. Gendarmes are now the French armed police. There are *horse gendarmes* and *foot gendarmes.*

Geneal′ogy, the systematical investigation and exhibition of the origin, descent, and relations of families. Persons descended from a common father constitute a family. Under the idea of *degree* of relationship is denoted the nearness or remoteness of relationship in which one person stands with respect to another. A series of several persons, descended from a common progenitor, is called a *line.* A line is either *direct* or *collateral.* The collateral lines comprehend the several lines which unite in a common progenitor.

General Lien, in law, the right to retain possession of a chattel until payment be made, not only of any debt due in respect of that particular chattel, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend entirely upon contract express or implied from the special usage of dealing between the parties.

Generation, ALTERNATE (or metagenesis), that kind of multiplication, seen in some invertebrate animals or even in plants, in which parents produce progeny unlike, sometimes extremely unlike, themselves, while this unlike progeny give rise to others resembling the original forms. Sometimes there are more than one unlike form between these like forms. The Hydrozoa abundantly illustrate this phenomenon, also the Echinoderms, Polyzoa, Tunicata, the wheel animalcules, Nematoid worms, flat worms, tape worms, several of the true Annelids; among Crustaceans, Daphnia, the Phyllopods; among insects, the plant lice. The steps may be seen in certain of the Hydroid Polyps, thus: 1, There is an ovum or egg, free-swimming and impregnated. 2, This

ovum attaches itself to a fixed submarine object, and develops into an organized animal. 3, This organism produces buds or zooids, often of two kinds—one set nutritive, the other generative—unlike each other and unlike their parent, the whole forming a hydroid colony. 4, The generative set mature eggs, which on being liberated become the free-swimming ova, and the cycle is renewed. A somewhat similar phenomenon is that of *parthenogenesis.*

Generation, SPONTANEOUS (or Abiogenesis), the doctrine that living matter may originate spontaneously, "that under certain circumstances dead matter may build itself up into living matter without the intervention of already existing protoplasm." In the seventeenth century this was the dominant view, sanctioned alike by antiquity and authority, and was first assailed by Redi, an Italian philosopher. Buffon held the doctrine in a very modified degree. He held that life is the indefeasible property of certain indestructible molecules of matter which exist in all living things, and have inherent activities by which they are distinguished from not-living matter, each individual living organism being formed by their temporary combination. Of course it is only animals or plants of very low type and minute size that have been supposed thus to be produced spontaneously from dead matter; and the readiness with which such appear, in circumstances in which one might suppose no germs of them could be present, gives some countenance to the belief. Thus even at the present day authorities are found who still declare their adherence to the doctrine of spontaneous generation, but there is every reason to believe that, whatever may have been the case with the first beginnings of life, living matter is now invariably derived from pre-existent living matter.

Genesee (jen-e-sē′), a river which rises in Pennsylvania, flows n. through New York, and falls into Lake Ontario 6 mi. below Rochester, after a course of 145 mi. It is notable for its varied and romantic scenery, and its extraordinary falls. These falls are five in number; three of them occur about 90 mi. from the mouth of the river, and are respectively 60, 90, and 110 ft. high. The other two are near Rochester, and are both about 100 ft. high.

Genesis (Greek, creation, birth, origin), the first book of the Bible and of the Pentateuch. From the Greek translators it received the name it is now commonly known by. Genesis consists of two great but closely connected divisions: 1, The history of the creation, the fall of man, the flood, the dispersion of the human race. 2, The history of the fathers of the Jewish race.

Geneva (je-nē′va), a town of Switzerland, capital of the canton of the same name, situated at the western extremity of Lake Geneva, where the Rhone issues, here crossed by several bridges, and dividing the town into two portions, the larger and more important of which is on the left or south bank. It was formerly surrounded by walls and regular fortifications, but since 1850 these have been removed. The town is divided into two parts, an upper and a lower. The upper town consists of well-built houses and handsome hotels; the lower town, the seat of trade and residence of the poorer classes. The more important public buildings are the cathedral or church of St. Pierre, the townhouse, the Musée Rath, the university building, and the museum of natural history. The only important manufactures of Geneva are those of watches, musical boxes, and jewelry. Geneva has ample railway communication, and is one of the principal entrances for tourists and travelers into Switzerland. In literature and science Geneva has long occupied a distinguished place, and it has been the birthplace or the residence of many eminent men, including Calvin, Beza, Knox, Le Sage, Necker, De Candolle, Rousseau, Sismondi, etc. Pop. 71,807. The canton has an area of 109 mi. It belongs to the basin of the Rhone, and the only streams of importance are that river and the Arve. Abundant crops of all kinds suitable to the climate are raised, and the whole territory wears the appearance of a garden. Manufactures consist chiefly of clocks and watches, musical boxes, mathematical instruments, gold, silver, and other metal wares, woolen cloths, and silk goods of various descriptions, hats, leather, and articles in leather; and there are numerous cotton mills, calico printing works, and dye works. Its constitution of 1848 is the most democratic in the federation. Pop. 101,595.

Geneva, Ontario co., N. Y., at n. end of Seneca Lake. There are four railroads, the principal one being the N. Y. C. & H. R. It is the seat of the state agricultural experiment station and of Hobart College. Chief industries: manufacture of engines, boilers, steam heaters, etc.; has also fruit tree nurseries. Pop. 1900, 10,433.

Geneva, LAKE OF (or Lake Leman), the largest of the Swiss lakes, extending in the form of a crescent. Length, measured on its north shore, 55 mi., and on its south shore 40 mi.; central breadth, about 6 mi.; area, 331 sq. mi.; greatest depth, 900 ft. It is 1,150 ft. above the sea.

Geneva Convention, an agreement concluded at an international conference held in Geneva in 1864, for the succor of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers.

Genghis Khan (or Jenghis Khan) (jen′gis) (1160–1227), Mongol conqueror. He succeeded his father when only 14 years of age, and made himself master of the neighboring tribes. A great number of tribes now combined their forces against him. After much intestine warfare with various Tartar tribes Genghis was proclaimed khan of the United Mongol and Tartar tribes. The country of the Uigurs, in the center of Tartary was easily subdued, and Genghis Khan was now master of the greatest

part of Tartary. The conquest of China occupied the Mongols more than six years. The capital, then called *Yenking*, now *Peking*, was taken by storm in 1215 and plundered. Bokhara and Samarcand, two cities in Turkestan, were stormed, pillaged, and burned. In 1225 he marched in person at the head of his whole army against the king of Tangut (Southwestern China), who had given shelter to two of his enemies, and had refused to give them up. A great battle was fought, in which the king of Tangut was totally defeated. The victor remained some time in his newly-subdued provinces, from which he sent two of his sons to complete the conquest of Northern China. At his death his immense dominions were divided among his four sons.

Genius, a tutelary deity; the ruling and protecting power of men, places, or things; a good or evil spirit supposed to be attached to a person and influence his actions. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius; that is, a spiritual being, which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career.

Genlis (zȧn'lēs), Stéphanie Félicite Ducrest de St. Aubin, Countess de (1746–1830), French authoress. At seventeen she married the Count de Genlis. In 1782 the Duc de Chartres appointed her governess of his children. She obtained great influence over her employer, and was the object of no little scandal in her relations with him. Her works, which embrace a wide variety of subjects, amount altogether to about ninety volumes, and include some of the standard novels in the French language.

Genoa (jen'o-a), a seaport of North Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean. It is beautifully situated at the foot and on the slope of the Ligurian Alps. It is enclosed by extensive fortifications, and the heights around are crowned with detached forts. In the older parts of the town the streets are extremely narrow, with lofty buildings. In the newer quarters many of them are spacious, and are lined with palaces and other noble edifices. The principal are: the Ducal palace, the Palazzo del Municipio or townhall, the Palazzo Brignole or Rosso, the Palazzo Pallavicini, the Palazzo Reale, and the palaces of Doria, Serra, Cambasio, Balbi, and Durazzo. The most remarkable of the churches is the Duomo, or Cathedral of St. Lorenzo, S. Maria in Carignano, S. Stefano, S. Ambrogio, and the Assumption of Guido Reni. The principal charitable institution is the Albergo de Poveri. Others are the Ospedale del Pammatone, and a hospital recently built by the Galliera family. Among the theaters of the city may be mentioned the Teatro Carlo Felice. Besides the university the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, and the navigation school. The building of the Bank of St. George, one of the most ancient banks of circulation and deposit in Europe, is now used as a customhouse. In one of the open spaces there is a fine marble statue of Columbus. The Campo Santo, or cemetery, is one of the most beautiful burial grounds in Europe. The manufactures of Genoa include cotton and silk goods, gold, silver, paper and leather goods, sugar, and preserved fruits. The principal articles of export are cereals, oils, fruit, cheese, rags, the products of its manufactures, etc. Many emigrants embark here. Imports: cotton, wool, wheat, sugar, coffee, coal, hides, iron, etc. Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The rivalry between Genoa and Venice was a fruitful source of wars during the twelfth and fourteenth centuries. Meanwhile the city was internally convulsed by civil discord and party spirit. In the absence of internal tranquillity the city sometimes submitted to a foreign yoke in order to get rid of anarchy. In 1528 the disturbed state regained tranquillity and order, which lasted till the end of the eighteenth century. The form of government established was a strict aristocracy. The nobility were divided into two classes—the old and new. By little and little Genoa lost all her foreign possessions. Corsica, the last of all, revolted in 1730, and was ceded in 1768 to France. After the battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the empire of France, in 1815 to the kingdom of Sardinia, with which it has become a portion of the kingdom of Italy. Pop. 206,485.

Genseric (jen'), a king of the Vandals, who, having obtained joint possession of the throne of Spain with his brother Gonderic, crossed the Straits of Gibraltar with 50,000 men, A. D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. He, however, soon declared his independence, and, having completely defeated Bonifacius, founded a kingdom, which, in 439, had its seat at Carthage.

Gentian, a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue, yellow, or red, often showy, flowers. The calyx consists of four or five valvate segments, and the corolla is four or five parted; the fruit is a two-valved, one-celled, many-seeded capsule. They are for the most part natives of hilly or mountainous districts in the northern hemisphere. The root has a yellowish brown color and a very bitter taste, and is imported into U. S. in considerable quantities, where it is used medicinally, and also as an ingredient of cattle foods. Several species grow in this country.

Genus, in scientific classification, an assemblage of species possessing certain characters in common, by which they are distinguished from all others. It is subordinate to *order*,

tribe, and *family*. A single species, possessing certain peculiar characters which belong to no other species, may also constitute a genus, as the giraffe.

Geoffrey of Monmouth, an ecclesiastic and historian of the twelfth century. He sprang from the Norman settlers in Wales; became archdeacon of Monmouth, whence he was, in 1152, raised to the bishopric of St. Asaph. He d. in 1154. His famous history was first published in 1128. This *Chroniconsive Historia Britonum* is now known to be, as the compiler states, chiefly a translation from an ancient book in the Breton tongue, discovered by Walter Calenius, an archdeacon of Oxford. It contains a pretended genealogy of the kings of Britain from the time of the fabulous Brutus, or Brute, the Trojan, to the death of Cadwallader, king of Wessex, in 688. It was soon translated into French, English, and Welsh, and became a great source of romance to the writers of successive generations.

Geoffroy St. Hilaire (zhof-rwȧ san tē-lār), Etienne (1772–1844), French naturalist. He was educated at the colleges of Navarre and Lemoine. At the age of twenty-one he obtained the chair of zoology in the Parisian Jardin des Plantes. As a member of the Egyptian expedition in 1798 he founded the Institute of Cairo. In 1807 he was made a member of the institute, and in 1809 professor of zoology at the Faculty of Sciences. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera.

Geoffroy St. Hilaire, Isidore (1805–1861), French physiologist and naturalist. In 1824 he was appointed assistant to his father at the Jardin des Plantes. He was elected to the Academy of Sciences in 1833, and afterward became successively inspector general of the university, member of the council of public instruction, and professor of zoology at the Academy of Sciences.

Geographical distribution in the vegetable and animal kingdoms. As long as it was held that each species must have been created, as a general rule, within the geographical area which it now occupies, the most curious facts of distribution could not be regarded seriously. But when the idea came to be entertained that allied species have had a common origin, it was obviously implied that they, or their ancestors, must have had a common birthplace; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire how this came about. One of the principal means of throwing light on this subject must obviously be to consider by what means animals and plants are able to disperse themselves across the barriers at present existing. It is scarcely necessary to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, and especially, among land animals, by those having the power of flight; and in connection with this means of dispersal the most important thing to note is that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in this respect in an earlier stage of existence. Such, for example, are univalve and bivalve marine mollusks, which are all developed from free-swimming larvæ.

But, besides the normal means of locomotion, there are many other modes of dispersal which it is highly important, with reference to the present inquiry, to take into account. First, there is the power of winds as a distributing agent. The carrying power of winds is known to be sufficient to bear along in the air fine dust across seas many hundreds of miles in width; and, that being the case, we have in that agency alone an adequate means of accounting for the dispersion of all plants propagated by minute spores. What part winds may have played in carrying the seeds of phanerogamous plants across arms of the sea is a more doubtful point; but there are observations which show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as a means of transport for very long distances. But, in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course. Still more frequently, in all probability, are the eggs of such creatures transported by this means.

Next, marine currents also form, beyond doubt, a highly important means of dispersal for both plants and animals, and that in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still in a condition fit for germination. But further, marine currents often carry on their surface various kinds of natural rafts, which may be the means of transport both for plants and animals. In the polar regions icebergs and icefloes may serve this purpose; and elsewhere trunks of trees, and even fragments torn from the land. Such fragments, forming small islands with erect trees upon them, have been seen at a distance of 100 mi. from the mouth of the Ganges and other rivers.

Again, locomotive animals are very frequently the means of dispersing both plants and other animals. Seeds may be attached to the plants or fur of mammals or the plumage of birds, or may be enclosed in clumps of earth clinging to the feet or some other part of bird or beast, even of insects. It seems probable that aquatic birds and water beetles have been the means of distributing aquatic plants and fresh-water mollusks, which are remarkable for their wide diffusion; and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means, like the sea anemones so frequently attached to the shells of crabs. Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another. The foreign plants

found growing on ballast heaps are instances of this, and so also are the plants which have sprung from seed introduced with imported grain or other articles of import. Since the discovery of America the whole of the northern part of the continent is said to have been more or less overrun with European weeds; and, according to Agassiz, the roadside weeds of the New England states, to the number of 130, are all European.

In the preceding summary of the more important means of diffusion for plants and animals, some of the obstacles to diffusion have been incidentally referred to; but it will be convenient to make a general survey of these also. For all land plants and land animals the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide it is seldom passable except with the aid of man. For land mammals the ocean is an absolutely impassable barrier, and hence native mammals are always absent from oceanic islands (that is, islands that have never been connected with the mainland). The jaguar, the bear, and the bison are capable of swimming the widest rivers; pigs have been known to swim ashore when carried out to sea to a distance of several miles; and even a boa constrictor, it is said, has swam to the island of St. Vincent from the South American coast, a distance of 200 mi.

Mountains, and especially high mountains, are also frequently effective barriers to the migration of land plants and animals, but it must be noticed that in some cases they serve for both as a means of communication between one region and another, enabling plants and animals belonging to a cold climate, for example, to spread into latitudes where, in the plains, the climate is too hot for them. Again deserts act as a barrier to the majority of plants and animals; forests are a barrier to the hare, camel, zebra, giraffe, etc.; treeless regions to apes, lemurs, and many monkeys; plants to wild goats and sheep. Broad rivers also act occasionally as barriers to distribution, and that, strange to say, even in the case of some species of birds. Another important barrier is that of climate; but, with reference to this, it must be observed that the question of climate affects the problem of geographical distribution, in the proper sense of that term, only in so far as climatic conditions may shut off plants and animals from means of communication between one region and another, and not where climate merely limits the range of a species or group within a continuous area.

Another set of barriers may be classed under the general head of organic, inasmuch as they are all connected with the vegetable or animal life of the region where such barriers exist. Under this head may be mentioned, first, the fact that certain animals require for their subsistence a special kind of vegetable food. The range of insects is liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason, in spite of the exceptional facilities for dispersal which, as

Geographical Distribution

we have already seen, they enjoy, are remarkable, as a rule, rather for the restriction of their areas of distribution than for their wide diffusion. But a more important, because more generally operative, organic barrier consists in the fact that a region being already fully occupied by a native flora and fauna, so that there is no room for newcomers, the barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it impossible to mark out any marine zoogeographical regions, though many seas and coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is at present a complete barrier for fishes requiring warm seas.

If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birthplace. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change.

The most remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands to the east of a deep channel between the islands of Bali and Lombok, a channel the significance of which, as a boundary line for plants and animals, was first pointed out by Wallace, the great authority on animal distribution, hence called Wallace's Line. The great feature of this region (so far as animal distribution is concerned) is the almost total absence of all the forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials. The family just mentioned, though now restricted in the manner stated at the beginning of this article, was at one time spread over the whole world, but has in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about.

Turning now to marine distribution, we find evidence of the former absence of a land-barrier at the Isthmus of Panama in the identity of many species of fish on both sides of the isthmus. Changes in the climatic barrier have also had an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the north polar regions, that the affinities between the floras of Japan and Eastern North America must be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation—viz., that in former geo-

logical epochs a genial climate must have prevailed even within the polar circle, so as to allow of the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the north this flora was driven southward, and became differentiated according to the differences of climate in the more southerly latitudes to which it advanced. Hence the eastern parts of America and Asia, as they correspond pretty much in climate, came to correspond also more closely than other tracts in the same latitude in the character of their floras. The soundness of this surmise was afterward confirmed by the discovery of abundant plant remains of the Miocene Age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere.

As the result of all the processes of dispersal across the various barriers to migration, and of the changes in these barriers, we have the present distribution of plants and animals, which is such as to enable us to divide the terrestrial surface of the globe into more or less well-marked regions.

Geographical Societies are associations formed with the view of obtaining and disseminating geographical knowledge. In point of seniority the first of these associations is the *Société de Géographie* of Paris, founded in 1821, whose magazine, the *Bulletin de la Société de Géographie*, commenced in 1822. The Prussian *Gesellschaft für Erdkunde* held its first sittings in Berlin in 1828. The more important results of its investigations are published yearly in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*. The American Geographical Society was founded at New York in 1852, and publishes an interesting journal.

Geography, the science which treats of the world and its inhabitants, giving an account of the earth as a whole, and of the divisions of its surface, natural and artificial, describing the different countries, states, provinces, islands, cities, etc. It may be regarded as embracing several departments or branches. *Mathematical Geography* is that branch of the general science which is derived from the application of mathematical truths to the figure of the earth, and which determines the relative positions of places, their longitudes and latitudes, the different lines and circles imagined to be drawn upon the earth's surface, their measurement, distance, etc. *Physical Geography* treats of the physical condition of the earth, its great natural divisions of land and water, the atmosphere, and the movements of oceanic and aërial currents; the geological structure of the earth; and the natural products of the earth, vegetable and animal. It is concerned chiefly with general laws and principles, as they are manifested upon a grand scale, and in the organic kingdom with the existence of groups of animals and plants. *Political Geography* embraces the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and treats of their government, laws, social organization, etc.

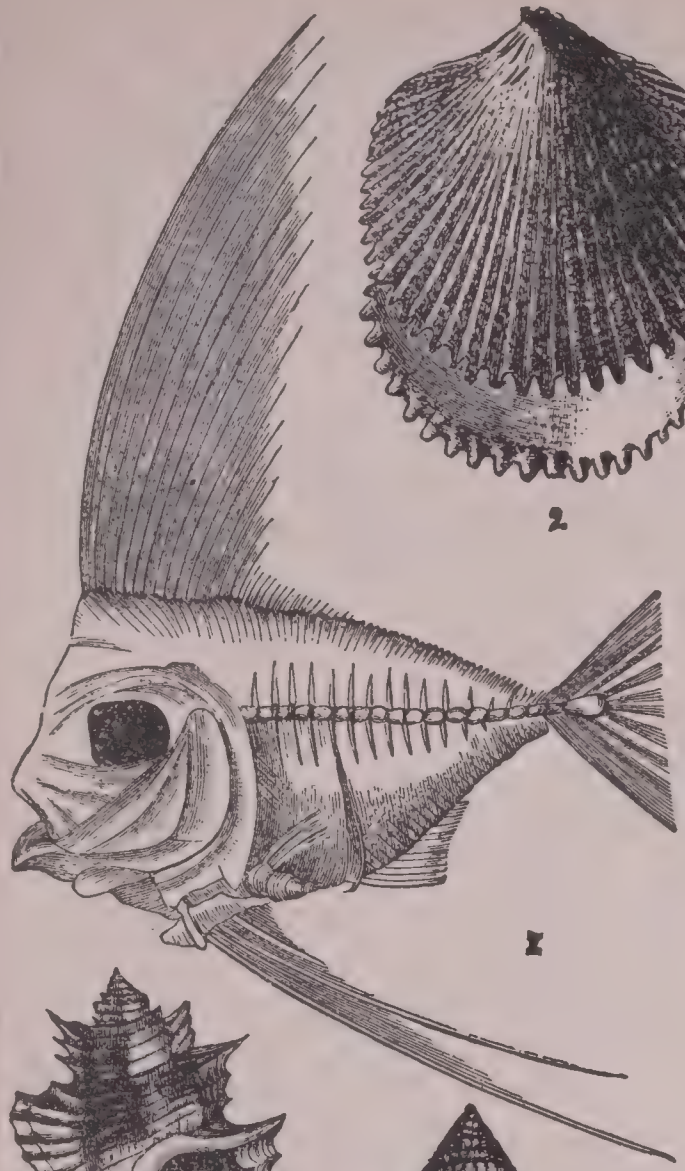
The earliest idea of the earth formed by mankind seems to have been that it was an immense disc, in the center of which their own land was situated, surrounded by the ocean, and covered by the sky as with a canopy. The Phœnicians were the first people who made any great progress in extending the bounds of geographical knowledge. They seem to have explored all the shores of the Mediterranean, and at an early period to have passed the Pillars of Hercules (the Strait of Gibraltar), and visited to some extent the Atlantic shores of Europe and Africa, extending their voyages as far north as Britain, and as far south as the Tropic of Capricorn. In the Homeric poems (which may be regarded as representative of the ideas entertained by the Greeks about the commencement of the ninth century B.C.) the earth is supposed to resemble a circular shield surrounded by a belt of water which was the source of all other streams. The world of Herodotus extended from the Atlantic to the western boundary of Persia, and from the Red Sea or Indian Ocean to the amber lands of the Baltic. The Indian expedition of Alexander the Great greatly enlarged the ancient knowledge of Northern and Eastern Asia. About 320 B.C., Pytheas, a seaman of Massilia, a Greek colony, sailed along the western coasts of Spain and Gaul, visited Britain, and pursuing his voyage, discovered an island, henceforward famous as *Ultima Thule*, which is supposed to have been Iceland. Eratosthenes (276–196 B. C.) first used parallels of latitude and longitude, and constructed maps on mathematical principles. He considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one center. The geography of Strabo, a Greek of Pontus, written about the beginning of the Christian era, embodies all that was known of the science at that period. The countries lying round the Mediterranean were known with tolerable accuracy, but the Atlantic shores of Europe were very vaguely comprehended, while of the northern and eastern portions the most erroneous notions prevailed. Pomponius Mela, an early Roman geographer, wrote about the time of the Emperor Claudius. He divided the world into two hemispheres, the Northern or known and the Southern or unknown; the former comprising Europe n. of the Mediterranean and w. of the Tanais (Don); Africa s. of the Mediterranean and w. of the Nile; and Asia. The next famous geographer is Ptolemy, who lived at Alexandria about the middle of the second century A. D. In Europe, Spain and Gaul were now correctly delineated; together with the southern shores of Britain. Northern Germany and the southern shores of the Baltic were pretty well known, as also some portion of Russia in the neighborhood of that sea, and the southern part of European Russia. In Asia it was considered certain that there were wide regions inhabited by nomadic tribes called Scythians, while from the far East came some vague reports of China. The geography of Ptolemy remained the acknowledged

authority during the whole of the Middle Ages. From his time up till the thirteenth century no advance was made in geographical knowledge until Marco Polo opened up new fields of inquiry. The account of his travels first made known to Europe the existence of Japan and of many of the East Indian islands and countries. Then followed the discovery of America in 1492, and from this time forward the progress of discovery was extremely rapid. In 1497 the Cape of Good Hope was doubled by Vasco da Gama, four years after its discovery by Bartholomew Diaz. Within thirty years from the date of the first voyage of Columbus the whole of the east coast of America from Greenland to Cape Horn had been explored. In 1520 Magellan passed the straits which bear his name, and his vessel, crossing the Pacific and Indian oceans, returned to Europe by way of the Cape of Good Hope, being the first that had circumnavigated the globe. The west coast of America was explored as far as the Bay of San Francisco about the middle of the sixteenth century. At the same time discovery in the East advanced with rapid strides. Within twenty years of Gama's arrival in India the coasts of East Africa, Arabia, Persia, and Hindustan had been explored, and many of the islands of the great Archipelago discovered. The expeditions of Willoughby and Forbisher in 1553 and 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, though they failed in their object of finding a n.w. passage to India, materially enlarged our knowledge of the Arctic regions. By the middle of the seventeenth century the Dutch under Tasman and Van Diemen, made the Australasian Islands known to the world. Late in the following century Captain Cook added largely to geographical knowledge by his survey of the Pacific and its innumerable islands. The Antarctic continent was discovered in 1840 by American, English, and French expeditions, and the northwest passage round North America was found by M'Clure in 1850. The travels of Humboldt, Spix and Martius, Lewis and Clark, Fremont, and others, have made us acquainted with the general features of the American continent. In Asia numerous travelers have contributed much to render our knowledge certain and precise in respect to a great part of the continent. The interior of Australia has been explored by Sturt, Eyre, Leichhardt, Burke, Wills, King, M'Douall, Stuart, etc. The opening up of the African interior has been materially advanced by the explorations of a host of travelers, including Bruce, Park, Denham, Clapperton, the Landers, Burton, Speke, Grant, Baker, Barth, Livingstone, Rohlfs, Schweinfurth, Cameron, Stanley, etc. The progress which has marked recent discovery has been materially assisted by the governments of various countries, and by the numerous geographical societies formed during the present century. The scientific study and teaching of geography are becoming more and more recognized to be of high importance, and in both at present Germany takes the lead.

Geology is the science which treats of the history of the earth, as ascertained by the study of its exterior or crust, investigating the successive changes which have taken place in the rock masses composing it, their relations, structure, and origin, and discussing also the main features of the animal and vegetable life of the past as bearing on the earth's history. The present condition and conformation of the earth is the result of vast changes in the past and of agencies working through immense periods of time, and the same or similar agencies may still be seen at work producing similar changes. Thus rocks, both aqueous and igneous, are still being formed. The former receive their name from owing their origin mainly to water, which acts both chemically and mechanically on the crust of the earth, in wearing down rocks and soils and carrying the debris often to considerable distances. The sediments thus carried to sea, or into lakes and estuaries, are spread abroad in the water, and form stratified deposits, which in course of time solidify into rock. With sufficient time all land would thus be eventually degraded beneath the sea, were it not that the loss is compensated by disturbance and elevation of land always slowly taking place over great portions of the continents and islands of the world. Such disturbances have produced strange phenomena among the stratified rocks, which may be contorted, tilted up, dislocated, or otherwise changed from their original arrangement. The strata resulting from aqueous deposits are consolidated (petrified) chiefly by pressure and chemical decomposition and recomposition. Some formations are many thousands of feet in thickness. Contraction of the crust of the earth due to radiation of the heat of the earth into space, has also had immense effects, the result being that over broad areas rocky masses have been contorted and compressed to a great degree, and mountain ranges upheaved.

Igneous rocks also form a considerable portion of the visible crust of the earth, though much smaller in amount than those of sedimentary origin. Some of the igneous rocks consist of beds of volcanic ashes, others of old lavas, others of masses of matter which were intruded in a melted state from below among the strata. Granite is the most important and widely spread of the igneous rocks, and is generally regarded as the fundamental rock of the earth's crust. Rocks that have been melted are known to be igneous by their structure, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, etc., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and feldspathic dykes, or old lava beds, and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded on the strata.

That the rocks which form the crust of the earth had the same general origin with the igneous rocks and sedimentary strata now forming has been well established, and that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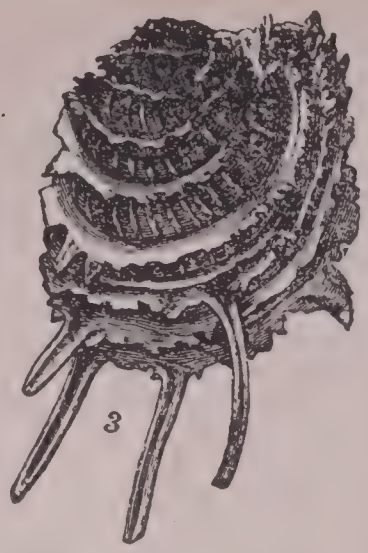
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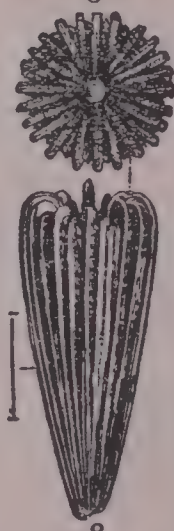
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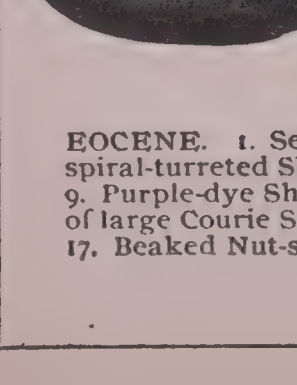
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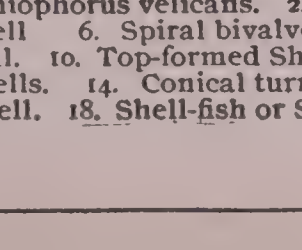
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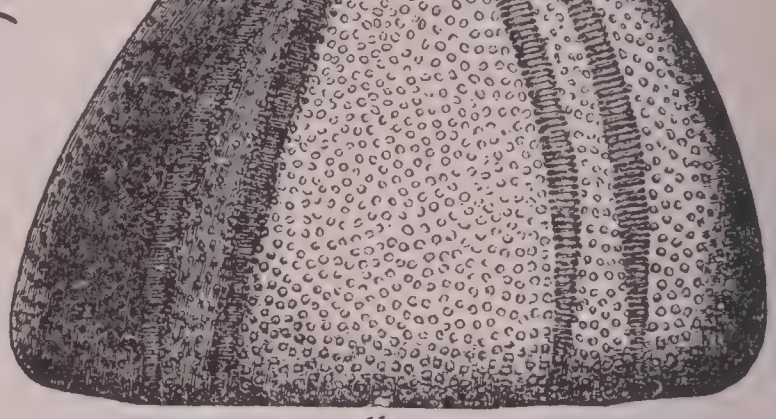
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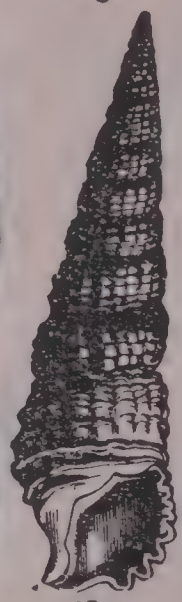
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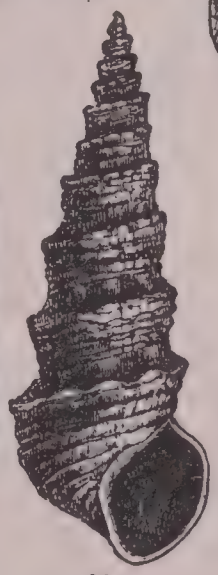
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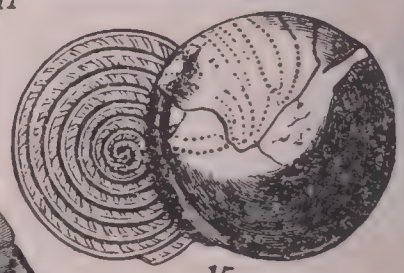
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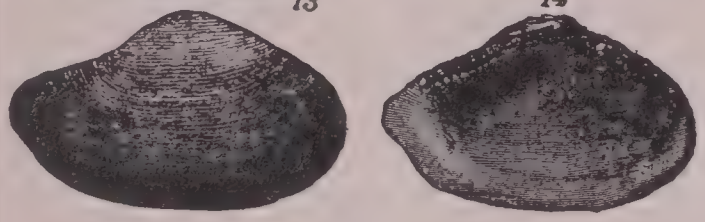
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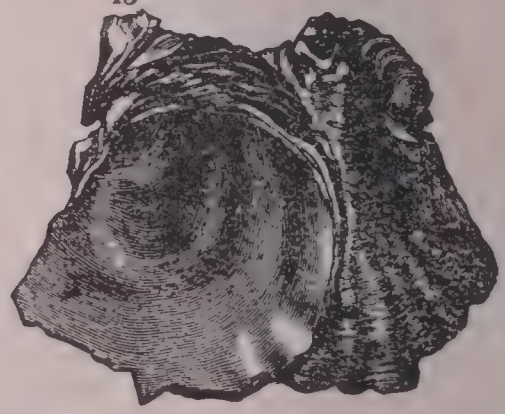
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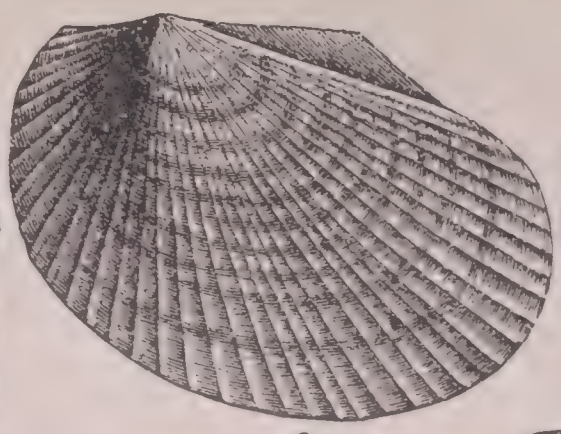
EOCENE. 1. Semiophorus velicans. 2. Lady Cockle. 3. Bivalve Molusks. 4. Cone-shaped Shell. 5. Long spiral-turreted Shell 6. Spiral bivalved Shell. 7. Venericardia planicosta. 8. Torbinolia Bowerbanki. 9. Purple-dye Shell. 10. Top-formed Shell. 11. Cone-shaped Shell. 12. Cerithium lamellosum. 13 Species of large Courie Shells. 14. Conical turreted Shell. 15. Coin-shaped Shell. 16. Shell with rough surface. 17. Beaked Nut-shell. 18. Shell-fish or Spout-shell. 19. Class of common Oysters.



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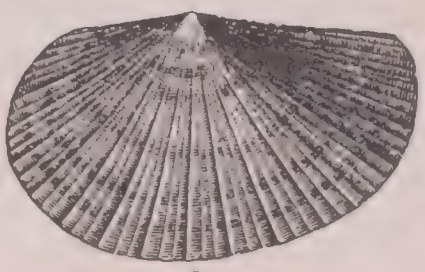

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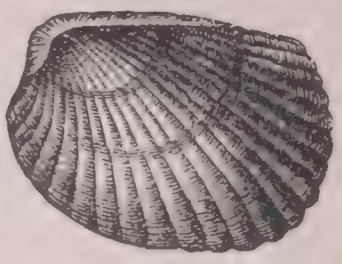

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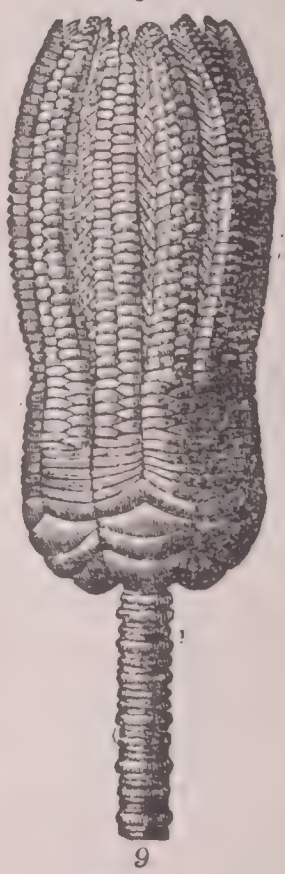

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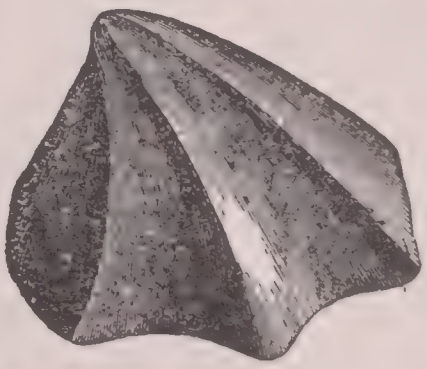

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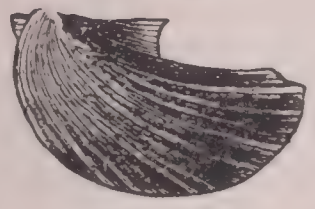

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ALPINE TRIASSIC 1. Snake stone or Ammon's Horn. 2. Species of Ammon's Horn. 3a. Ear-shaped Shell. 4b. Ear-shaped Shell. 5. Heart shaped Shell. SHELL-LIME. 6. Common Auger Shell. 7. Sailor Shell. 8. Mussel-shaped Shell. 9. Stone or Sea-lilies. 10. Blister Shell. 11. Turnip-shell. 12. Gervillia Sociallis. 13. File-like serrated Shell. KEUPER. 14. Bivalved Wing-shells. COLORED SANDSTONE. 15. Glove Shells.

there is a regular succession of strata from the older to the newer, the oldest being normally lowermost, the newest uppermost, is also well ascertained. A corresponding succession in regard to the animal and vegetable life of former ages has also been proved by the fossils that accompany the successive strata. This *superposition of strata* and *the succession of life in time* are two cardinal doctrines in geology. Observation and experiment alike establish the doctrine of superposition. Each great group of rocks consists of several subdivisions called *formations*, and each group, and even to a considerable extent each minor subdivision, is characterized by the presence of distinct assemblages of organic remains. The successive appearance of such remains, which constitutes *the succession of life in time*, was the great discovery of Wm. Smith, made a century ago. The main rock systems into which the earth's crust is divided, and which are based on the characteristics of the organic remains contained in them, are shown in the following table in ascending order:—

Life Periods.	Rock Systems.	
Post-Tertiary or Quaternary. .	Recent—Alluvium, Peat, etc.	
	Pleistocene.	
Tertiary or Kainozoic. .	Pliocene.	
	Miocene.	
	Oligocene.	
	Eocene.	
Secondary or Mesozoic. . . .	Cretaceous.	
	Jurassic.	Oolitic.
		Liassic.
	Triassic.	
Primary or Palæozoic. .	Permian.	
	Carboniferous.	
	Devonian and Old Red Sandstone.	
	Silurian.	
	Cambrian.	
Archæn, Laurentian, or Eozoic.	Fundamental Gneiss.	

Igneous rocks also are associated in different localities with the systems named in the foregoing table.

Archæan, Pre-Cambrian, or *Laurentian Rocks.*—The *Laurentian* are the oldest known of the sedimentary rocks. They are *metamorphic* (that is, changed from their original structure), and mostly gneissic in character. No fossils have yet been observed in these roeks. The *Huronian Rocks* of North America are possibly intermediate in age between the Laurentian and the rocks next mentioned.

Cambrian.—These rocks come next in succession to the Laurentian strata. The term Cambrian has been used differently by different geologists. In most places they are unfossiliferous. Numerous fossils in purple shales among the lowest beds of the series have been found, including a small bivalve crustacean and two brachiopods. In the higher part of the series two sponges and various trilobites have been found.

The *Silurian Rocks* are divided into the *Lower* and *Upper Silurian.* The former comprises in ascending order the *Lingula beds*, the *Tremadoc slate*, the *Llandeilo flags*, and the *Caradoc* or *Bala beds.* The Lingula flags (*Potsdam sandstone* of North America) rest conformably on, and in fact pass by gradations into, the Cambrian rocks. They consist of black and gray slaty rocks with beds of grit. The Skiddaw region consists of black slates. Above these there lies a great series of volcanic rocks, consisting of feldspathic lavas and ashes, commonly known as the green slates and porphyries. The most characteristic fossils of the Lower Silurian are the crustaceans known as trilobites, of which more than 200 species are known to belong to these rocks. The chief groups forming the Upper Silurian are, in ascending order, the *Pentamerus beds*, the *Tarannon shale, Woolhope limestone, Wenlock shale, Wenlock limestone*, and *Ludlow rocks*, in the middle of which is the *Aymestry limestone.* In North America the Oriskany and Niagara beds are of this age. All of these formations are in general terms fossiliferous. The Wenlock limestone is in great part formed of corals, encrinites, shells, and trilobites, corals predominating. Near the top of the Upper Ludlow strata there are several thin bone beds containing small teeth and scales and defenses of placoid fish; with the exception of a fragment of a fish found in the Lower Ludlow beds in Shropshire, these are the oldest known fishes.

Old Red Sandstone and Devonian.—The *Old Red Sandstone* first received that name in contradistinction to the *New Red Sandstone*, the former occurring below, and the latter above, the Carboniferous strata. Where the uppermost Silurian strata join the Old Red Sandstone there is a gradual passage between them. The absence of marine shells and the nature of the fossil fishes of the Old Red Sandstone indicate that the formation was deposited, not in the sea, but in a great fresh-water lake, or in a series of lakes, for the nearest living analogues of many of the fish are the Polypterus of the African rivers, the Ceratodus of Australia, and in less degree the Lepidosteus of North America,

The name *Devonian* has been given to a series of rocks bearing fossils intermediate in character between those of the Upper Silurian and those of the Carboniferous limestone, and which are considered as the equivalents of the Old Red Sandstone. The terms Devonian and Old Red Sandstone are thus generally considered equivalent in point of time. These rocks have been divided into *Lower*, *Middle*, and *Upper Devonian.* The lower beds chiefly consist of slaty beds, and green and purple sandstones, with brachiopods. The middle group, which includes the Plymouth limestone, contains numerous corals. The Upper Devonian group contains land plants some of which are identical with those found in the Lower Carboniferous limestone shales.

Carboniferous Rocks, so named on account of the masses of coal contained in them, consist chiefly of limestone at the base and coal measures above. The *Yellow Sandstone* beds form a kind of passage from the Old Red Sand-

stone to the carboniferous rocks, and the plants have carboniferous affinities. The coal-measure beds consist of alternations of sandstone, shale, fire clay, or underclay, coal, and ironstone. Underneath each bed of coal is a bed of underclay with the roots known as Stigmariæ, forming the soil in which the plants were rooted, by the decay of which, passing into peat, material was supplied for the production of coal. In the carboniferous rocks more than 500 species of fossil plants have been named, a large proportion of which are ferns, including some tree ferns. Coal fields occur in France, Belgium, European Turkey, Hungary, Russia, India, China, Borneo, New Zealand, Australia, etc. The largest known coal fields in the world are in the U. S.

The *Permian* series succeeds the carboniferous rocks, and were long considered as part of the New Red Sandstone. They were named *Permian* by Sir Roderick Murchison, from the government of Perm, in European Russia, where they largely occur. They consist of sandstone, red marl, etc., and contain a bed of the magnesian limestone. Excepting the Magnesian limestone, all the Permian rocks are red, and all, including this limestone, seem to have been deposited, not in the sea, but in an inland salt lake, or in lakes.

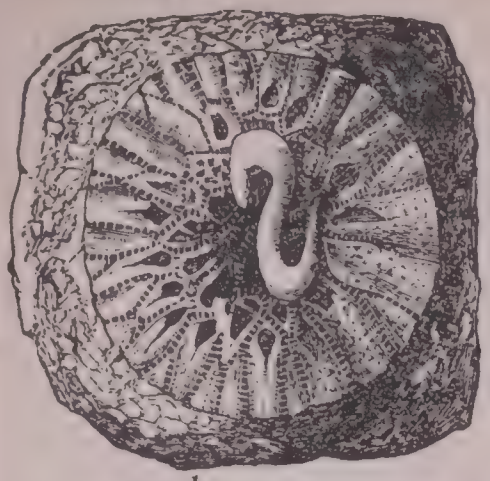
The *New Red Sandstone*, or *Trias*, succeeds the Permian strata. It has received the name of *Trias* from the fact that when fully developed, as in Germany, it consists of the three great divisions of *Keuper*, *Muschelkalk*, and *Bunter Sandstein*. Few old genera and no species pass thus far upward. The majority of the genera of Brachiopoda disappear, and the whole grouping of the fossils now ceases to be Palæozoic, and assumes a character common to the Secondary rocks. The Muschelkalk is a gray shelly limestone, rich in fossil mollusca. This rock salt was deposited in supersaturated salt lakes during the Keuper period; and this could only have been done by evaporation due to solar heat acting on the waters of salt lakes which had no outflow, like the Great Salt Lake of Utah, for example. The Keuper red marl (Upper Trias) varies from 500 to 2,000 ft. in thickness, and contains, besides other fossils, footprints and bones of reptiles. The Triassic rocks of Virginia and North Carolina contain workable beds of coal. The red sandstone of the Connecticut Valley is of Bunter age. Above the Keuper strata occur a series of beds called the *Rhætic beds*, from similar strata in the Rhætic Alps. At the base of the Rhætic beds have been found minute teeth of the earliest known mammal, a small, insect-eating marsupial.

The *Lias* and *Oolite* series succeeded the New Red and Rhætic beds. The Lias and Oolite together are termed *Jaurassic*, because in a typical form they are largely developed in the range of the Jura. The Lias consists, in descending order, of the Upper Lias shale, or clay; Marlstone; Lower Lias shale, or clay and limestone. The *Lower Lias* is about 900 ft. thick, and consists of beds of blue clay interstratified with beds of blue argillaceous limestone. The

Lower Lias clay and lime, as a whole, is rich in the remains of life. These include crinoids, decapod crustaceans, Terebratulæ, and other Brachiopoda, and numerous Lamellibranchiate molluscs. Fish are numerous, and there appear in the Lower Lias a great number of remarkable reptiles, some of gigantic size. The *Marlstone* series, or *Middle Lias*, which is generally a brown, ferruginous, soft, sandy rock, is rich in many forms of ammonite and belemnite, etc. From the *Upper Lias clay* much alum shale, as also the well-known Whitby jet, is obtained. It is a stiff, unfertile, dark-blue clay.

The *Inferior Oolite*, the lowest member of the Lower Oolite, chiefly consists of beds of yellow limestone. Much of the limestone is oolitic, that is to say, it is formed of small concretionary bodies, like the roe of a fish, cemented together in a calcareous matrix. Above the Inferior Oolite limestone lies the *Fuller's earth*, so named because it contains in places beds of that substance. The formation consists of stiff blue clay, which varies in thickness from a few feet to 200 ft. The *Great* or *Bath Oolite* succeeds, and consists of Great Oolite, covered by *Forest Marble*, and passing downward into *Stonesfield Slate*, which forms its base. The Stonesfield Slate consists of beds of shelly laminated and oolitic limestone, with numerous fossils, among them remains of mammals, viz., the lower jawbones of four genera of small insectivorous marsupials. The Bath Oolite, of which the Forest Marble forms the upper part, is best developed near Bath, where it yields the celebrated stone of which that city is built. Among fossils of the Bath or Great Oolite are reptiles of the genera Teleosaurus and Megalosaurus, together with the gigantic Ceteosaurus (or whale lizard), probably about 50 ft. in length.

The *Middle Oolite* consists of the *Upper Calcareous Grit*, *Coral Rag*, *Lower Calcareous Grit*, *Oxford Clay*, and the *Kelloway Rock*. The Oxford Clay is a dark blue clay, about 600 ft. thick where best developed. The Kelloway Rock is an occasional thin band of calcareous sandstone near its base. The Coral Rag is a rubbly limestone. It is associated in places with sandy strata known as the *Calcareous Grits*, and is often almost entirely composed of broken shells and sea urchins. The *Upper Oolite* consists of the *Portland Limestone and Sand and Kimmeridge Clay*. In places it is 500 or 600 ft. thick, and consists of a stiff blue and sometimes black clay or shale. The Portland Limestone and Sand are best seen in the Isle of Portland. The celebrated Portland stone has been used in many public buildings. Like those of all the other Oolite formations it is cream colored, and generally fossiliferous. As regards the fossil remains of the Lias and Oolite, a remarkable feature is the vast development of Cephalopoda, especially of the genera *Belemnites*, *Nautilus*, *Ammonites*, and *Ancyloceras*. There are also many genera and species of fishes, chiefly in the Lias, and the genera and species of reptiles are so numerous that this life-period has been sometimes called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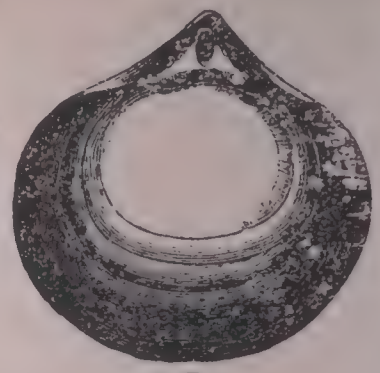
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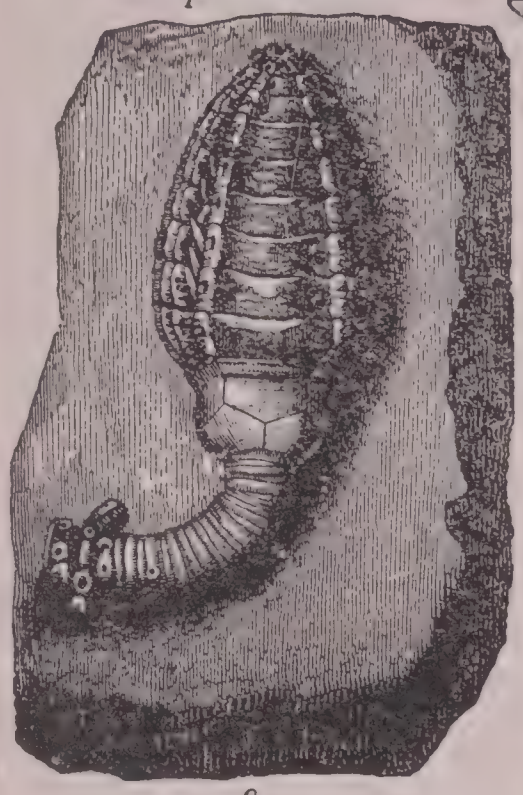
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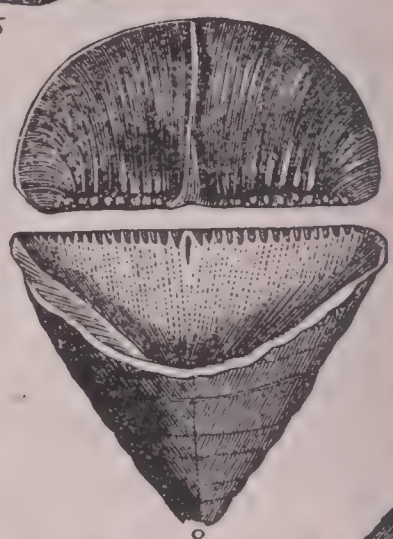
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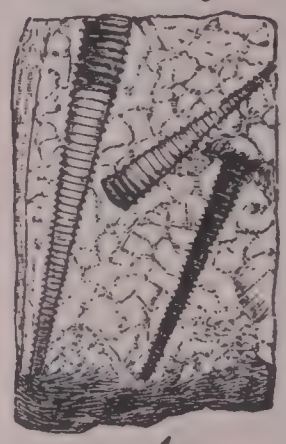
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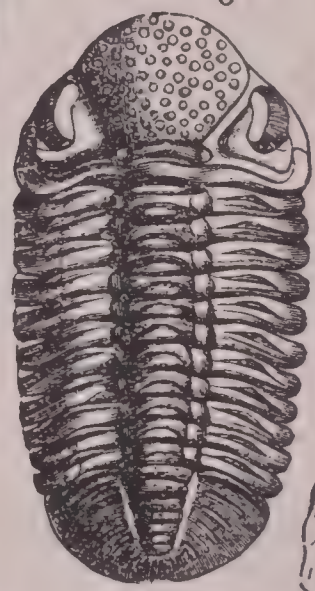
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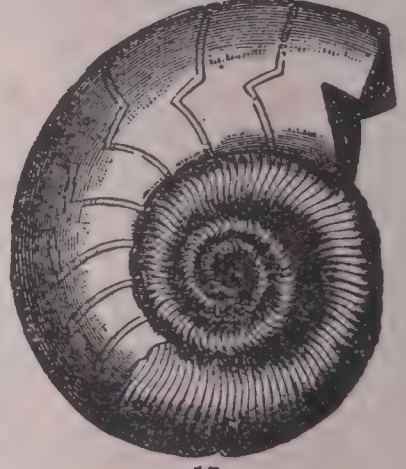
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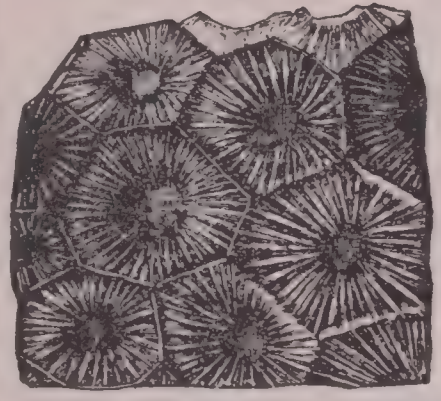
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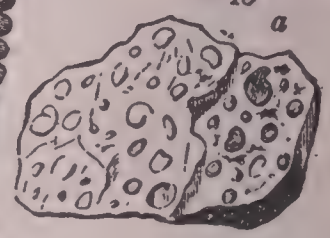
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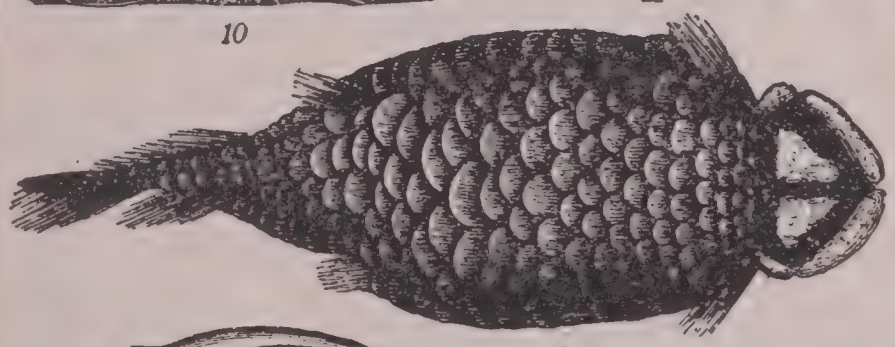
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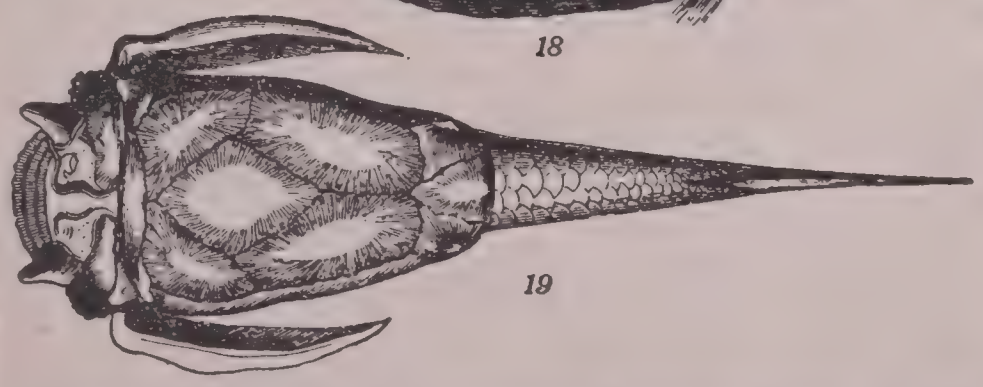
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LOWER DEVONIAN. 1. Pleurocdictum problematicum. 2. Trigonal, acutely-beaked Shell. 3. Striated or plated Shell. 4. Long-pointed, tube-like Shell. MIDDLE DEVONIAN. 5. Shell of triangular Fissures. 6. Cyrtina heteroclita. 7. String-headed Shell. 8. Bivalved slipper-shaped Shell. 9. Shell with cup-like Calyx. 10. Leaf and cup-shaped Shell. 11 Acroculia prisca. 12. Shell with concealed Face. 13 Four horned Shell. UPPER DEVONIAN. 14. Cup and Cube formed Shell. 15. Quoit-shaped coiled Shell. 16. Cypridina serratostriata. 17. Goniatite Shell. OLD RED SANDSTONE. 18. Fosselfish with large Scales. 19. Horned winged Shell.

"the age of reptiles." The plants include ferns, horsetails, conifers, cycads, etc.

Purbeck and Wealden Strata.—These form a series of transition strata between the Oolite and the Cretaceous systems. The Purbeck beds, which succeed the Portland stone, are chiefly fresh-water strata, and the Hastings, sand, and Weald clay are almost exclusively fresh-water beds. Several remarkable reptiles occur in the Weald.

The *Cretaceous Formation* is divided into a lower and an upper series of strata. The chief member of the former is the *Lower Green-sand*, forming a series of strata overlying the Wealden beds. The general character of the whole formation are white, yellow, ferruginous, and gray and green sands.

The *Gault*, which forms the base of the *Upper Cretaceous* series, is a stiff blue clay about 300 ft. thick in its thickest development. In general lithological characters, the *Upper Green-sand* in places somewhat resembles the Lower Green-sand. In part of the Wealden area it is difficult to separate from the Gault, there being a passage from one to the other.

The *Chalk*, from its familiar characters and uniformity of structure, is the most easily recognizable of all formations. It consists of a soft white limestone, and on examination with the microscope, much of it is found to consist of the shells of Foraminifera, Diatomacea, spiculæ and other remains of sponges, Polyzoa, and shells, highly comminuted. Somewhat similar deposits are now forming in the open Atlantic at great depth. The Lower Chalk usually contains no flints, and is somewhat marly at the base, while the Upper Chalk is interstratified with many beds of interrupted flints. Plants are comparatively few in the Chalk, but animal remains are very numerous. More than eighty species of fish are known; various great reptile forms, as the Mosasaurus, Plesiosaurus, and Ichthyosaurus, Pterodactyles, etc. There is a marked discordance between the fossils of the Chalk and those of the Tertiary rocks; no fossils (except, perhaps, one Terebratula) being common to the two groups. In America the Cretaceous epoch presents some extraordinary reptilian forms of immense size, also various birds. The sands and marls of New Jersey are of this age, and similar beds occupy extensive tracts in the western regions; but there is no true white chalk in America.

Of the *Tertiary* strata the *Eocene Rocks* form the lowest division. The strata are divided into the Lower Eocene and the Upper Eocene or *Oligocene.* The Lower Eocene rocks lie sometimes on upper beds of Chalk, and sometimes on beds lower in the series. They are therefore highly *unconformable*, and in this we have the reason of the complete difference in the species of the Cretaceous and Eocene rocks, for great continental areas of Chalk were upheaved above the sea, and remained as dry land for a period of time so long that when they were again submerged the life of Cretaceous times had died out, and other forms appeared. To the Lower Eocene belong the *Thanet Sand*, the *Woolwich*, and *Reading* beds, the *London Clay*, and the *Bagshot Sands* and *Clays.* Its fossil remains include various palm nuts and other fruits and leaves. Remains occur of birds allied to the vulture and kingfisher, and a small swimming-bird with tooth-like serratures on the bill; turtles and river tortoises are numerous. The Wahsatch, Bridger, and Uinta beds of North America are of Eocene age.

The *Miocene Rocks* are well represented by strata (mostly of fresh-water origin) in Central France (Auvergne, etc.) and Switzerland. Over many parts of Europe, Asia, and America there are other Miocene strata, each more or less possessing peculiarities.

The *Post-tertiary* or *Quaternary* Epoch is that immediately before the period in which we now are. It is characterized especially by various glacial phenomena, and in particular by numerous evidences of a glacial period, when the northern hemisphere was subjected to a climate of the utmost rigor.

Geometry, as its name implies, was primarily the mathematical science which has for its object the measurement of portions of the earth's surface; but now geometry may be termed the science which treats of the properties and relations of definite portions of space, such as surfaces, volumes, angles, lines. The relation between the parts of the same figure may be of two kinds,—of position, of magnitude; for example, two points in a straight line, four points on the same circle, two straight lines perpendicular to one another, a straight line tangent to a circle, are relations of position. On the other hand, the proportionality of homologous lines of two similar figures, the equality of the square constructed on the hypotenuse of a right-angled triangle to the sum of the squares constructed on the other sides containing the right angle, that of the volumes of two pyramids on equal bases and of the same height, are relations of dimensions. But the relations of position govern the relations of dimension, and *vice versa;* that is, the one set of relations depend upon the other. Thus it is because a triangle is rectangular that the square constructed on one of its sides is equivalent to the sum of the squares constructed on the other two, and, *vice versa*, that relation between the magnitudes of the squares on the three sides depends on the triangle being right-angled. The geometer may draw indifferently from the study of a figure either the knowledge of the relations of position or that of the relations of dimension, on the condition that he knows how to apply relations of the one kind to those of the other; and the principal aim of geometry is to examine into the connection between the relations of magnitude and those of position.

Geometry may be conveniently divided into several principal sections—elementary geometry, practical geometry, analytical geometry, infinitesimal geometry, etc. *Elementary geometry* comprehends two parts—plane geometry, the object of which is the study of the simplest figures formed on a plane by straight lines and

Geometry

circles; and solid geometry or geometry of three dimensions, which treats of straight lines and planes considered in any relative position whatever, of figures terminated by planes, of the cylinder, of the cone, and of the sphere. *Analytical geometry*, either plane or solid, makes use of the method of co-ordinates introduced by Descartes and primarily applied to curves. In ancient times, though curves were studied and the principal properties of conic sections known, still no connection existed between these curves, nor was there any means of establishing one, so that the study of one was of no value to that of another. The first question in introducing the analytic method was then to fix upon some means which should serve to construct every curve by successive points as numerous and as closely brought together as is necessary in order to lay down the curve. Now the position of a point in a plane may be determined by two intersecting perpendiculars drawn from two fixed lines—the co-ordinate axes—at right angles to each other. An equation may then be found which states the relation between the co-ordinates of any point, that is, its distance from the two co-ordinate axes. See *Co-ordinates.* The study of the curves will thus be simply the study of their equations. In this way a typical equation for a curve in a certain system may be got, so that if at another time the curve is represented under another definition in investigating its equation in the same system of co-ordinates, particularized so as to simplify as much as possible the calculations, it will suffice to compare the particular equation with the general one to verify the identity of the curve, to give it its name, and to know all the properties of it which have been studied previously. In a similar way the analytical geometry of solid bodies is based on the fact that the position of any point in space can be determined by reference to three intersecting planes. *Infinitesimal geometry* is simply a continuation of the analytical geometry of Descartes, of which it may indeed be said it forms a part; the difference consists simply in the nature of the questions which, as they involve the measurement of magnitudes, the incessantly variable elements of which cannot be summed up by finite parts, require the use of the infinitesimal calculus. *Descriptive geometry* consists in the application of geometrical rules to the representation of the figures and the various relations of the forms of bodies according to certain conventional methods. In the descriptive geometry the situation of points in space is represented by their orthographical projections, on two planes at right angles to each other called the *planes of projection.*

History.—The origin of geometry is assigned by an ancient tradition to Egypt, but the history of the science, as far as it is known, commences in Greece with Thales (639–548 B. C.). To him is attributed the discovery of the properties of triangles. His disciple, Pythagoras (b. about 580) founded a celebrated school in Italy where geometry was as highly honored as philosophy. He discovered the theorem of the square of the hypotenuse, thus completing, so to speak, the geometry of polygons. He was also the first to show that the circle contains a greater area than any plane figure having the same perimeter, and that the sphere contains the greatest volume bounded by a given surface. After him Anaxagoras, Hippocrates of Chios, Theodorus of Cyrene, and Archytas of Tarentum cultivated the science and have left names connected with various problems; but the next great development of the science is due to Plato and his disciples, who laid the foundation of the analytical method and developed the fundamental principles of geometrical *loci.* Euclid, who belonged to the famous school of Alexandria, and flourished about 285 B. C., has the merit of collecting and systematizing all the more important problems and theorems worked out by his predecessors, besides adding many new ones of his own. He also wrote various other mathematical works, a book of *Data*, a treatise on *Porisms*, etc., most of which have been lost. It is in his *Elements of Geometry*, which is still the favorite text-book, that the method of proof known as the *reductio ad absurdum* is first found. After Euclid came Archimedes (287–212 B. C.). Among his achievements is the determination of the ratio of the diameter of a circle to its circumference, and the investigation of the areas of the circle and parabola and other problems much more difficult than any previously attacked. Archimedes had completed that branch, the object of which is the comparison with each other of magnitudes of the same nature; Apollonius (247 B. C.) made an analogous progress in that which treats specially of the properties of figures. His eight books of *Conics*, in which he considers these curves in the oblique cone, which had not been done until that time, contain almost all their interesting properties, those which relate to the foci, tangents, asymptotes, or diameters, and to their involutes. Eratosthenes, Nicomedes, the inventor of the conchoid; Hipparchus, who made some progress in spherical trigonometry; Menelaus (80 A. D.); Ptolemy (125 A. D.), Pappus (390), and Proclus (440), continued the fame of the Alexandrine school. Diophantus introduced methods of an algebraic kind, and was the model on which the Arabic geometers, and Leonard of Pisa, Cardan, and finally Vieta formed themselves. He is thus the connecting link between the ancient and modern geometricians. After the sack of Alexandria and the burning of its library the science was confined to India and to the Arabic school of commentators, and it was not till the middle of the sixteenth century that geometry revived in Europe with Vieta (1540–1603), who introduced the use of algebraic symbols for the solution of geometrical problems. Trigonometry owes to him most of the elegant formulæ which now constitute it. In the writings of Kepler (1571–1631) we find the first applications among the moderns of the method of exhaustions of Archimedes freed from the difficulties which had encumbered the geometry of the Greeks;

and to Cavalieri (d. 1647) belongs the honor of an entirely new method for quadratures and cubatures. Descartes (1586–1650), developing Vieta's discoveries, created the science of analytical geometry, which greatly extended the domain of geometrical science. Fernat (1570–1633), and Barrow (1630–77), with their methods of tangents and maximums; Huyghens (1629–95), with the theory of involutes, were on the road to the differential calculus, as Roberval, Pascal, and Wallis with their processes of summation were to the integral calculus. Newton (1642–1727) and the brothers Bernouilli (1654–1705, 1667–1748) made important contributions, such as the theorem on the generation of curves of the third order and the method of isoperimeters. About the beginning of the nineteenth century a decided advance was made by Monge (1746–1818) and Carnot (1753–1823). The descriptive geometry of the former established the whole theory of projections. Carnot's first contribution to geometrical science was his principle of the *correlation of figures*, a principle which, having been further generalized, is now known as the *principle of continuity*. His second contribution was his *theory of transversals*. On these inventions is founded *modern geometry*, which has revolutionized the science, and has given us generalized conceptions previously undreamed of. Among the later geometricians who have contributed to extend the method and domain of the science we may mention Poncelet for his theory of reciprocal polars, Charles for his treatise on porisms, etc.; Sir William Rowan Hamilton for his invention of quaternions, an entirely new method; Cayley and Sylvester for their application of generalized geometrical methods to space of more dimensions than three.

George, Henry (1839–1897), an American political economist, b. in Philadelphia; went to California when a boy and engaged in journalism. In 1879 he published *Progress and Poverty*, in which he promulgated the "single tax" theory. (See *Single Tax.*) He went to New York in 1880, and six years later was candidate for mayor of that city on the union labor ticket, but was defeated. He was again nominated for mayor of New York in 1897 by the Jeffersonian democrats, but died before the election, and his son, Henry George, Jr., filled the vacancy upon the ticket.

George, St., a saint. His origin is very obscure, one of many legends representing him as a prince of Cappadocia martyred by Diocletian. He was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (April 23) should be observed as a national holiday in England; in 1350 he was made the patron of the Order of the Garter by Edward III.

George, Order of St. The following are the principal of the numerous orders which have been founded in honor of St. George: 1, A military order instituted in Russia in 1769 by the Empress Catharine II as a reward of military achievements. 2, An order instituted in Bavaria by the Emperor Charles VII (Charles Albert) in 1729, and reorganized by King Louis II in 1871. 3, An order instituted by Ernest Augustus of Hanover in 1839. 4, A Sicilian military order, instituted by Joseph Napoleon 1808, and remodeled by King Ferdinand IV in 1819. 5, The name under which the Order of the Garter was first instituted in England.

George I (George Louis), king of Great Britain and elector of Hanover. He was b. in 1660, and in 1682 was married to Sophia Dorothea of Zell, whom, in 1694, on account of a suspected intrigue with Count Königsmark, he caused to be imprisoned and kept in confinement for the rest of her life. In 1698 he succeeded his father as elector. He commanded the imperial army in 1707 during the War of the Spanish Succession, and ascended the throne of Great Britain on the death of Queen Anne, in 1714. Among the notable events of his reign were the rising of the Scottish Jacobites (1715–16); the triple and quadruple alliances against Spain (1717 and 1718); the failure of the South Sea Company (1720).

George I ("King of the Hellenes") (1845–), was b. at Copenhagen, second son of the king of Denmark. In 1863 he was elected king by the Greek National Assembly. In 1867 he married the Princess Olga, a niece of the Russian czar. His conduct as a constitutional monarch has always been correct and regular, and he has won the popular sympathies by the efforts he has made on behalf of the expansion of Greek nationality. His children are all bred up in the Greek faith. The crown prince is Constantine, duke of Sparta, b. Aug. 2, 1868.

George II (George Augustus) (1683–1760), king of Great Britain, son of George I. He married in 1705 Wilhelmina Carolina of Brandenburg-Anspach. In 1708, then only electoral prince of Hanover, he distinguished himself at Oudenarde under Marlborough. In 1727 he succeeded his father on the English throne, but inherited to the full the predilection of George I for Hanover. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy which then adorned England. The War of the Austrian Succession, in which George II himself took part at Dettingen, the Jacobite Rebellion of 1745, the conquest of Canada, and the growth of the British Empire in India are among the chief events of his reign.

George III (1738–1820), king of Great Britain, was the eldest son of Frederick, prince of Wales, by the Princess Augusta of Saxe-Gotha, and succeeded his grandfather, George II, in 1760. In the following year he married the Princess Charlotte Sophia of Mecklenburg-Strelitz. The sixty years of his reign are filled with great events, among which are the Wilkes' controversy; the American Revolution, 1775–83; the French Revolution, 1789, and the Napoleonic wars which followed; the Irish Rebellion, 1798, etc. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death, his biography is a blank.

George IV (George Frederick Augustus)

(1762–1830), king of England, son of George III and the Princess Charlotte of Mecklenburg-Strelitz. In 1811 George became regent, and, on the death of George III in 1820, king. The most important event after his attaining the throne was the passing of the Catholic Emancipation Act, by the Wellington ministry in 1829. George IV left no descendants, his only daughter, the Princess Charlotte, wife of Leopold of Saxe-Coburg, having died childless in 1817. He was therefore succeeded by his brother, William, duke of Clarence (William IV). See *Britain.*

George, Lake, a lake in New York state, between Warren and Washington counties, s. of Lake Champlain, into which it discharges at Ticonderoga. It is 36 mi. long, and from ¾ mi. to 4 mi. in width. It is surrounded by lofty hills wooded to the top, has richly wooded shores, and many picturesque islands. Caldwell, Bolton, and other places on its banks are favorite resorts, and in summer large numbers of tourists are attracted by the beauties of its scenery.

George's Channel, St., the arm of the sea which separates Ireland from Wales s. of the Irish Sea. From Holyhead and Dublin on the n. to St. David's Head and Carnsore Point it extends about 100 mi., with a breadth varying from 50 to 70 mi. Its depth in the middle varies from 40 to 70 fathoms. The bottom is chiefly sand and gravel.

Georgetown, D. C., a suburb of Washington, separated by a small creek but connected by street cars. It is at the head of navigation on the Potomac, is a port of entry, and has large flouring mills. It is the seat of Georgetown College besides many other institutions.

Georgetown (or Demerara), the capital of British Guiana, at the mouth of the Demerara. It is neatly built, consisting of broad streets at right angles, with canals in the middle, and lofty wooden houses, often with luxuriant gardens attached. The chief exports are sugar, rum, and coffee. Pop. 47,175, of whom only about one seventh are pure whites.

Georgia, one of the original thirteen states of the Union, bounded n. by Tennessee and North Carolina, e. by South Carolina and the Atlantic, s. by Florida, and w. by Alabama; length, north to south, 320 mi.; breadth, 255 mi.; area 59,475 sq. mi. (about same as England and Wales). The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea island cotton is raised. The natural features of the state present almost infinite variety, both as regards its topographical and geological structure. Within the limits of Georgia may be found representatives of almost all the geological periods of the earth's formation. Its river systems are magnificent, and add greater beauty to a country whose other characteristics are so disposed as to present a grandeur of scenery and variety of productions and climate rarely met with. The state is particularly rich in minerals, nearly every important natural deposit in the catalogue being found in one or the other portion of her domain. Metals from gold to iron abound in large quantities, while stones and rocks of various degrees of value and usefulness, together with coal, are available and add to the material prosperity of the people.

Climate.—The climate is greatly diversified, and, while in some places—particularly in the alluvions—malarial and unhealthy, yet in the higher lands the air is salubrious and bracing, and the mortality statistics of the country will compare favorably with those of any other state of the Union. The range of the thermometer is very slight, being usually between 95° maximum in summer and 10° minimum in winter, only in exceptionally severe seasons does the mercury sink to the neighborhood of zero, and the severest weather known to occur was only 5° below.

Vegetation.—Its vegetation includes almost the entire range of the temperate and subtropical regions, embracing in its flora, sylva, and grasses many of the most valuable, useful, and beautiful of each. The food crops consist generally of rice, sugar cane, sweet potatoes, and corn, with a moderate supply of wheat. Cotton, hay, and various food grasses grow most abundantly, while the ranges of pine and other forests furnish a generous sustenance for stock and swine. The fruits comprise apples, pears, peaches, oranges, lemons, bananas, together with grapes, cherries, and other small fruits. Tobacco grows well, while occasionally rye, oats, and barley are met with. Peanuts form an important article of agricultural production.

Manufactures.—In manufactures, Georgia ranks as the twenty-fifth state in the Union. The more recent industries are the lumber trade, and extensive cotton, woolen, and other manufactures. The most important mills are at Augusta, Columbus, Atlanta, Athens, and Roswell. There are now within the state about 60 cotton and woolen mills, while the lumber, flour, grist, and pulp mills, etc., are being multiplied, and the iron and steel trade in the northwestern part of the state is overtaking the cotton manufacture in importance. Pitch, tar, turpentine, cotton seed oil, and tobacco are important products.

Education.—There exists in Georgia a thorough system of free common schools; separate schools are conducted for both white and colored pupils. Opportunities for higher education are afforded by the University of Georgia, at Athens, by its dependent colleges at Dahlonega, Milledgeville, Thomasville, Cuthbert, and Atlanta, and by sundry denominational colleges. At the University of Georgia and its dependent colleges tuition for Georgians is free. Georgia has also a school for the blind at Macon, for the education of the deaf and dumb at Cave Spring, and an asylum for lunatics near Milledgeville.

History.—The colony of Georgia was founded by James Oglethorpe (q.v.) in 1733, as a refuge for poor debtors and for the persecuted Protestants of Germany, and received its name in honor of George II. In 1752 Oglethorpe sur-

render his charter to the British government. Georgia was thereafter classed as an English province, until, with her sister colonies, she succeeded in casting off her allegiance to the crown. Georgia was one of the seceding states in 1861, and took an active part in the Civil War. The history of Georgia in the last few years has been one of material progress. The National Exposition held at Atlanta in 1881 was of great benefit to agricultural and manufacturing interests. The principal cities are, Atlanta, Athens, Augusta, Brunswick, Columbus, Macon, Rome, and Savannah. The popular name is the *Cracker State*. The population in 1900 was 2,216,329.

Governors.—George Walton, 1789–90; Edward Telfair, 1790–93; George Mathews, 1793–96; Jared Irwin, 1796–98; James Jackson, 1798–1801; David Emanuel, 1801; Josiah Tatnall, 1801–02; John Milledge, 1802–06; Jared Irwin, 1806–09; David B. Mitchell, 1809–13; Peter Early, 1813–15; David B. Mitchell, 1815–17; Wm. Rabun, 1817–19; Matthew Talbot, 1819; John Clarke, 1819–23; George M. Troup, 1823–27; John Forsyth, 1827–29; George R. Gilmer, 1829–31; William Lumpkin, 1831–35; William Schley, 1835–37; George R. Gilmer, 1837–39; Chas. J. McDonald, 1839–43; Geo. W. Crawford, 1843–47; Geo. W. B. Towns, 1847–51; Howell Cobb, 1851–53; Herschel V. Johnson, 1853–57; Joseph E. Brown, 1857–65; James Johnson, 1865; Chas. J. Jenkins, 1865–67; Gen. T. H. Ruger, 1867–68; Rufus B. Bullock, 1868–72; James Milton Smith, 1872–77; Alfred R. Colquitt, 1877–82; Alexander H. Stevens, 1882–83; Henry D. McDaniel, 1883–86; John B. Gordon, 1886–90; Wm. J. Northen, 1890–95; Wm. Y. Atkinson, 1895–98; A. D. Candler, 1898–1900–1902.

Georgia, was formerly a kingdom, but is now included in the Russian government of Tiflis, though the name is sometimes loosely employed to designate a much larger portion of the territory possessed by Russia south of the Caucasus. The natives are a fine looking race, the Georgian women, like the Circassians, being celebrated for their beauty. The history of the Georgians first becomes trustworthy about the time of Alexander the Great, to whom they became subject. About B.C. 324 they gained their independence under Pharnavas. They became Christianized toward the end of the fourth century. After yielding for a time to the supremacy of the Arabian caliphs Georgia regained its independence toward the end of the tenth century, which it retained till 1799, when Heraclius, successor of George XI, formally ceded his dominions to the Russian emperor Paul.

Georgia, Gulf of, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver's Island, about 120 mi. in length from north to south; the breadth varies greatly in its different parts, from 6 mi. to 20. It communicates with the ocean, on the north by Queen Charlotte's Sound, and on the south by the Straits of Juan de Fuca.

Georgia, South, an island in the South Atlantic, lat. at its north point, 53° 57′ s.; lon. 38° 13′ w. It is 90 mi. long, and has high and rocky coasts, inaccessible from ice during a greater part of the year. It abounds with seals and sea fowl.

Georgia Bark, a native shrub closely resembling the cinchona or Peruvian bark, found along the streams from South Carolina to Florida. It has pretty, large, white flowers, with longitudinal stripes of rose color, disposed in beautiful clusters at the extremities of the branches; each flower is accompanied with a floral leaf, bordered with rose color near the upper margin; the corolla is tubular; the stamens five, with a single style; and the capsule contains two cells and numerous seeds. The wood is soft and unfit for use in the arts. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

Georgian Bay, formerly called Lake Manitoulin, the n.e. part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 mi. long and 50 broad.

Gera (gā′rȧ), chief town of the principality of Reuss-Schleiz, in Germany, on the right bank of the Elster, 35 mi. s.w. of Leipsic. It has manufactures of woolen, linen, cotton, and other goods. Pop. 34,078.

Gerania′ceæ, a nat. order of exogenous plants, the distinguishing character of which is to have a fruit composed of five capsules or cases, connected with as many flat styles, consolidated round a long, conical beak, giving some of the species the name of stork's bill and crane's bill. These plants are usually astringent and odoriferous, and many of them have beautiful flowers, especially those of the genus *Pelargonium*, natives of the Cape of Good Hope. A few of them have edible tubers. See next article.

Geranium, the typical genus of the order Geraniaceæ, popular name, crane's bill. They

Geranium.

have usually palmately divided leaves and regular flowers with ten stamens and five carpels. An American species, from its astringency called "alum-root," is used medicinally as a gargle and otherwise. Cultivation has produced many varieties, which from their beauty are great favorites.

Gérard (zhā'rär), FRANÇOIS PASCAL, BARON (1770–1837), a French historical and portrait painter, b. at Rome; went to Paris (1786), and studied under David. Among his portraits the most famous are those of Talleyrand, Talma, Louis Philippe, Madame Récamier, Mlle. Mars, etc.

Gérard, JEAN IGNACE ISIDORE (1803–1847), a French caricaturist and book illustrator, generally known under the pseudonym of Grandville, was b. at Nancy. He was a contributor to *Le Charivari* and an illustrator of the works of Béranger, La Fontaine, *Gulliver's Travels*, *Robinson Crusoe*, etc.

Gérard, MAURICE ÉTIENNE (1773–1852), count, marshal, and peer of France. He distinguished himself in the battle of Ligny, and at Waterloo acted under Grouchy. He took an active part in the revolution of 1830; became war minister and marshal; commanded the troops which reduced Antwerp in 1832; became prime minister 1834; commander of the national guard 1838.

Gerbi (or Jerba), an island in the Gulf of Cabes, off the coast of Tunis. It is about 20 mi. long and 14 broad. The surface is level and fertile, and occupied by a population of 30,000, mostly Berbers.

Gerhardt (ger'hårt), KARL FRIEDRICH (1816–1856), German chemist. He is the author of several works, among which the most celebrated is his valuable *Traité de Chimie Organique.* He was the first to introduce the new combining weights, or rather to subject more completely combination by weight to combination by volume; to originate the theory of types, and to furnish new ideas on classification, homology, and similar subjects. The methods he originated have had a great influence on modern chemistry.

Germ, in physiology, the earliest form under which any organism appears, that is, the rudimentary or embryonic form of an organism. The name is also given to certain minute organisms which give rise to disease. See *Germ Theory.*

Germain (zher-man), ST., the name of a number of places in France, among which is St. Germain-en-Laye, a town in the department of Seine-et-Oise, about 6 mi. n. from Versailles and 11 mi. w.n.w. from Paris, on the left bank of the Seine. The most remarkable building is the royal palace, commenced by Charles V in 1370, and embellished by several of his successors, especially Francis I and Louis XIV. The forest of St. Germain is one of the finest in France, extending over 10,000 acres. Pop. 14,280.

German'icus, CÆSAR (B.C. 15–A.D. 19), a distinguished Roman, son of Nero Claudius Drusus and the younger Antonia, a niece of Augustus. When Augustus d. in A.D. 14, Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty but refused and quelled the revolt. In A.D. 16 he made his way into Germany, defeated the Cherusci twice, and made an incursion into the country of the Marsi. In A.D. 19 he visited Egypt and d. on his return to Syria under some suspicion of having been poisoned by Cn. Piso, the governor of Syria.

German Silver (Nickel Silver, or Packfong) is an alloy of copper, nickel, and zinc in different proportions, among which the following may be mentioned: spoons and forks are made from 2 parts copper, 1 nickel, 1 zinc; knife and fork handles from 5 copper, 2 nickel, 2 zinc, a mixture closely resembling alloyed silver; addition of lead produces an alloy which appears well fitted for casts, and for making candlesticks, etc.; iron or steel, on the other hand, makes the alloy whiter, harder, and more brittle. German silver is harder than silver, and takes a high polish. It melts at a red heat, the zinc being volatilized in the open air. It is attacked by the strong acids, but it is also affected by common organic acids, such as vinegar, and by some saline solutions.

German Tinder (or Amadou) is prepared from the *Bolētus fomentarius*, a fungus growing on the oak, birch, and some other trees, or from the *Bolētus igniarius* found on the willow, cherry, plum, and other trees. The fungus is removed with a sharp knife, washed, boiled in a strong solution of saltpeter, beaten with a mallet, and dried. In surgery it is sometimes used to stop local bleeding.

Germantown, Philadelphia co., Pa., a northern suburb of Philadelphia. Railroads: P. & R., and Pa. Manufactures: cotton and woolen goods, including yarns, hosiery, knit goods, etc. It is the site of the battle of Germantown (1777).

Germany (*Deutschland*), a country of Central Europe and one of the Great Powers, now more specifically called the *German Empire.* The territorial limits of the country and its importance have greatly varied. In the Middle Ages, and for 150 years of the Modern Era, it was a large and powerful empire. After 1648 its importance gradually declined, through dismemberment and the rise to greater power of certain states composing it, until in 1806 it was formally disorganized. From 1815 to 1866 the German Confederation included part of Austria, and most of Prussia; the kingdoms of Saxony, Bavaria, Würtemberg and Hanover; also Hesse-Cassel, an electorate, and numerous duchies, grand-duchies, principalities and free cities. In 1866 Austria was finally separated from Germany. From 1866 to 1871 Germany included 1, the North German Confederation, consisting of all the states north of the Main, of which Prussia was the head; and 2, the South German states; Bavaria, Würtemberg, Baden, and Hesse-Darmstadt, which were closely allied to the Confederation. In 1871 was formed the German Empire, as it still remains, with the king of Prussia as hereditary emperor. To the previous territory of Ger-

many was added Alsace-Lorraine. Schleswig-Holstein had been added to Prussia in 1866. The empire contains twenty-six states, of which the principal are: the kingdoms of Prussia (covering about two thirds of the total area), Bavaria, Saxony, Würtemberg; six grand duchies, of which the chief are Baden, Hesse-Darmstadt, Saxe-Weimar-Eisenach; five duchies, among which are Brunswick and Saxe-Coburg-Gotha; seven principalities; the three free cities of Hamberg, Bremen, and Lübeck; and the imperial territory of Alsace-Lorraine. Total area 208,738 sq. mi.; pop. 1895, 51,758,364. The German colonial possessions, acquired by purchase, conquest, or treaty since 1884, are the following dependencies and protectorates: In Africa, Kamerun, Togoland, German East Africa, German Southwest Africa; est. total area, 914,000 sq. mi., pop. 8,000,000, mostly native. In Oceanica, Kaiser Wilhelm Land (a part of New Guinea), Bismarck Archipelago, Solomon Islands, Marshall Islands; est. total area 90,000 sq. mi., pop. 250,000.

The kaiser represents the empire in all international affairs such as war and peace, treaties and alliances; is commander in chief of the army and navy. His revenue is derived from the customs receipts and from profits of postal and telegraph systems. The empire constitutes one customs union and commercial union, the *Zollverein;* internal trade is unrestricted, while in respect to foreign countries a high protective tariff is in force. Before 1871 the silver standard prevailed; since then the gold. Coinage is uniform throughout the empire. The metric system of weights and measures is prescribed. Bavaria and Würtemburg have their own postal systems. Each state administers its own internal affairs and levies taxes. In case of a deficit in the imperial revenue, each state contributes its share, but no imperial taxes are laid directly. The kaiser has a large income as king of Prussia. The legislative powers of the empire are vested in the *Bundesrath* (federal council) and the *Reichstag.* The members of the former (58) are appointed by the governments of the several states; its consent is necessary for a declaration of war, unless an attack has actually been made upon German territory. This body settles disputes between states. The Reichstag (397 members) is elected by universal direct ballot, on the basis of one representative to every 100,000 inhabitants. Members of both councils serve for three years. For the enactment of an imperial law the agreement of a majority of the Bundesrath and the Reichstag is necessary. The Reichstag is convoked, opened, adjourned, and closed by the emperor, subject to certain restrictions and constitutional rights residing in that body itself. It elects its own officers; members receive no pay. Every German must serve three years in the standing army, unless physically incapacitated, four in the reserve, and five in the *landwehr*, or militia. Active duty, in time of peace, is required only the first three years. No substitution is allowed, but the three years may be reduced to two or one by completing a certain course of education in the *gymnasia.* All the higher officers are appointed by the emperor, except in Bavaria. The army is poorly paid.

Education.—The educational system of Germany is deservedly famous; in all departments it is under the supervision of the state, the universities included. It varies somewhat in the several states, but is approximately uniform, and considered best in Prussia and Saxony. There are twenty universities, each with the four faculties, theology, law, medicine, and philosophy. In some the faculties of political economy and natural sciences have been lately added. The theological faculties are nearly all Protestant. The *gymnasium* prepares for the university, and corresponds to the American preparatory school. The *realgymnasia* prepare for a mercantile career. Throughout Germany all children must attend school for at least five years. Public libraries, museums, and art collections are numerous. In art, science, literature, and music Germany holds a high place; her scholars and scientists are renowned for patient, thorough, and faithful research. In music she has furnished most of the great composers: Bach, Handel, Haydn, Mozart, Beethoven, Mendelssohn, Meyerbeer, Weber, Wagner.

Population.—Of the population, more than nine tenths are German. The designations Low German and High German respectively refer to the people of North and South Germany, being due to the varying elevation of the country. Germany has lost more by emigration than any other country except Ireland. Of the inhabitants about 65 per cent. are Protestants, 35 Roman Catholics; the latter are in the majority in Bavaria, Baden, and Alsace-Lorraine. Berlin, the capital, has a population of over 1,500,000; Hamburg has 600,000; Munich, Breslau, Dresden, and Leipsic each from 300,000 to 400,000; Magdeburg and Frankfort, about 200,000 each. The principal river systems of Germany are the Rhine, Danube, Elbe, and Oder. The German rivers are in general long, but, compared with those of America, very narrow. Some are famed for the beautiful scenery on their banks, notably the Rhine and the Elbe. The soil of Germany is of varying fertility, being in some places marvelously rich, in others almost barren. Agriculture is carried on with great industry and on scientific principles. Agricultural colleges are numerous. The chief products are grain, beet root, hemp, flax, and wine. German wines are noted for their excellence, especially in the Rhine region, where all fruits of that latitude flourish luxuriantly. From beet root sugar is manufactured in enormous quantities. Tobacco is extensively raised on the upper Rhine, hops in Bavaria and Brunswick. The mineral products are rich and numerous, and mining is extensively followed; gold is rare; silver, iron, coal, zinc, and lead abundant. Salt is abundant in nearly all parts. Germany is a large importer of raw materials, and exporter of manufactured products. Her manufactures are the oldest in Europe; they

include, besides breadstuffs and sugar, cotton and woolen goods, hardware, jewelry, glass, porcelain, and beer. Saxony and Bavaria are famed for the two last named, respectively. Silks and linens, also toys and articles of wood, are likewise largely exported. The smaller wild animals and the deer are abundant in Germany, and are protected by strict game laws. Some breeds of domestic animals are famous, as the Holstein cattle. The forests of Germany are famed for their size and excellent condition. Laws are very rigid, not only for the public forests, but even for those of private owners. The roads are maintained by the state, and are noted for their uniform excellence. Railroads are operated by the state. The climate is temperate, and extreme heat or cold is seldom felt. The temperature is comparatively uniform in the varying latitudes of Germany, owing to the slope of elevation from south to north. In the south are spurs from the Alps, and from Central Germany low ranges radiate in various directions, but there are no lofty mountain systems. Most famous for their beautiful scenery are the Harz Mts. and the Black Forest; also the ranges of "Saxon Switzerland." The territorial boundaries of Germany are: n., North Sea, Denmark, Baltic; e., Russia and Austria; s., Austria and Switzerland; w., France, Belgium, and Holland.

History.—The Germans are one portion of the descendants of the Germanic branch of the Aryan, or Indo-Germanic, race. Of their earliest history nothing is known. In the first century B. C. they are found in the region n. of the Danube and e. of the Rhine, and are already separated from the kindred descendants of the Germanic branch. See article on *Germanic Races and Languages.* Mention is made as early as the period of Alexander the Great of German tribes on the Baltic coast, but the first historical event of importance was the defeat of the Teutones by the Roman general Marius (102 B.C.). The earliest authentic account of the Germans is that of Julius Cæsar in his *Commentaries* (58 B. C.). The name "Germani" was given by the Celts and adopted by the Romans; it probably meant "shouters in battle." "Deutsch" is a Germanic word meaning "people." It was originally used of the language; and was first applied to the people in the eleventh century. The Germani included about 50 tribes, of whom many appear at various times in Roman history. About 100 A. D. Tacitus wrote his *Germania*, a valuable and highly interesting, if not always strictly accurate, account of this people. Soon after 200 A. D. the great tribal divisions — Goths, Alemanni, Thuringians, Burgundians, Saxons, Franks — appear, on the lines of which the history of the Germans is followed during the next six centuries. Of these the Franks were the tribe destined to found the kingdom from which were to spring the future great nations of Europe. In 486 the ambitious Frankish chief Clovis defeated the Roman governor and set up his court on the future site of Paris. After overthrowing the Alemanni and the Visigoths, Clovis was

master of Gaul and of some German territory e. of the Rhine. At Clovis's death (511) the kingdom was divided among his four sons, but in 560 Clothaire, the youngest, was reigning over the whole Merovingian kingdom, to which Thuringia and Burgundy had been added. About the middle of the next century the kingdom was composed of three divisions —Neustria, Burgundy, and Austrasia. At the head of each was a high officer of the king known as mayor of the Palace. The royal power had become feeble. Between Neustria and Austrasia was a bitter antagonism, the former being Roman in character, the latter distinctly German. In 687 Pepin of Heristal, mayor of Austrasia, defeated the king and the Neustrian mayor, and virtually ended the Merovingian rule, although the power was not formally taken from that family until 751. Pepin and his son, Charles Martel (see art.) were kings in fact, if not in name. The latter's son, Pepin the Short, deposed the last Merovingian king with the sanction of Pope Zacharias, the first instance of the Papal See's taking part in the affairs of temporal rulers. He was the first of the Carolingian line, which received its name from Pepin's son and successor, Charlemagne (see art.), who extended the limits of the Frankish kingdom and restored the Roman Empire in the West.

German history may be divided into six periods, of which the first ends with the empire of Charlemagne (800). Period II extends to the Interregnum (1254), including the Carolingian, Saxon, Franconian, and Hohenstaufen kings. Period III comes down to the Reformation (1517). Period IV includes the Reformation, the rise of Austria, and the Thirty Years' War, to the Peace of Westphalia (1648). Period V is the era of French predominance in Germany; the rise of Prussia and the Age of Frederick the Great; the French Revolution and the Empire of Napoleon, to the Peace of Paris (1815). Period VI comes down to the present, and includes the German Confederation, the War with Austria, the North German Confederation, the Franco-Prussian War and the New German Empire. Charlemagne's son, Lewis the Pious (814–840), was unable to wield the scepter bequeathed to him. After 817 he shared the government with his sons, and they at his death disputed over the division. The battle of Fontenoy (841) led to the treaty of Verdun (843), by which the three brothers, Charles, Lothaire, and Lewis received divisions corresponding approximately to the modern countries of France, Italy, and Germany, respectively. Lothaire received the title of emperor. The separation thus effected would have been inevitable, owing to the characteristic and growing differences between the Romance and the German peoples. The history of Germany as a separate country now begins. Lewis the German reigned until 876, and made some progress toward national unity. Under Charles the Fat the three kingdoms, France, Italy, and Germany, were reunited for a short time (884–887). Charles being unable to defend Germany against the invading

piratical Northmen, the nobles deposed him, and elected Arnulf of Carinthia, his nephew (887). Arnulf defeated the Northmen (891). During his reign the ducal families of the several provinces increased in power. At his death (899) the government came under the control of the notorious Hatto, bishop of Mainz, the king, Lewis the Child, being only seven years old. On his death (911) Conrad I came to the throne. He was the last of the Carolingian line. Conrad's reign was occupied with futile attempts to protect Germany against the invading hordes of Magyars. He quarreled with the nobles and was defeated by Duke Henry of Saxony, who succeeded Conrad in 919 as Henry I (the Fowler), the first of the Saxon line, which ruled till 1024. He is called "the creator of the German Empire." He united the five dukedoms, built fortresses, and reformed the military system. After subduing the Wends (928) he drove the Magyars out of the country (933). At Henry's death, Otto I (the Great), his son, was unanimously chosen (936). Otto effected marriage alliances with the dukes, secured the crown of Italy by marrying the king's widow, and received from the pope the imperial crown (962). He won a great victory over the Magyars (955). The crown of the Roman Empire in the West was henceforth worn by the kings of Germany, as was also that of Italy for several centuries. Otto the Great reigned 37 years, and was succeeded by Otto II (973–983), a well-meaning but wavering monarch. Otto III (983–1002) was but three years old when crowned. The government was administered for some years by his mother and his grandmother Adelheid, The youthful and enthusiastic Otto wished to unite church and state, Rome to be the center of a world-empire. Just before his death, which occurred while he was laying siege to Rome, that city having rebelled, a conspiracy of German nobles was being formed to dethrone him. After some dispute, Otto having died without issue, Henry II (1002–1024) was elected. He restored order in the empire, but the dukes and even lesser nobles had now become hereditary rulers who held in check the royal authority instead of being subject to it, as under Otto the Great. With Henry the Saxon line became extinct and was followed by the Franconian, which ruled until 1125.

The first of the Franconian kings was Conrad II (1024–1039), cruel and severe in character, but energetic and valuable to the preservation of German unity. He subdued the nobles and recovered lands of the crown. He was a friend of Canute, the great Danish king, to whom Schleswig was restored. In 1033 the kingdom of Burgundy was joined to the empire. It was never in fact very closely connected with Germany, and was nearly all lost to France a few centuries later. Henry III (1039–1056), strengthened the empire materially, and gave it a wise and vigorous government. The nobles were made obedient, and the Hungarians driven from the boundaries of the empire. Henry taught the popes to respect his power, deposing three of them during his reign. Under his successor, Henry IV (1056–1106), the nobles formed conspiracies and greatly increased their power, owing to his troubles with the pope, Gregory VII. The latter having decreed that no priest or prelate should be subject to a temporal lord, Henry called a council and deposed him (1076). Gregory retaliated by deposing and excommunicating the emperor. Henry's discontented subjects revolted, and the emperor was forced to submit to the pope at Canossa. He afterward drove Gregory into exile. The decline of the royal power continued under his successors, Henry V (1106–1125), and Lothaire of Saxony (1125–1137), so that the title of emperor was reduced to an almost empty honor. The period of the Hohenstaufen emperors, or Suabian dynasty, is the most famous in mediæval German history. It is marked by a bitter conflict between the imperial and the papal power. In Germany and Italy were two great parties, the Welfs and Waiblings (or Guelphs and Ghibellines) who favored the pope and the emperor respectively. To this period belongs, too, the beginning of the Crusades. The first was undertaken 1095; and in the second (1147), the first Hohenstaufen emperor, Conrad III (1138–1152) took part. The most famous of the Hohenstaufens is Frederick I, Barbarossa (red-beard). He was greatly beloved, and had the support of all classes in his contest with papal authority. He was drowned while taking part in the Third Crusade (1190), after a reign of thirty-eight years. Many legends have gathered about his name, Frederick being a favorite in German song and story. In his contests with the Italian cities he was unsuccessful, but at home his government was wise and vigorous. He was followed by his son, Henry VI (1190–1197), who by marriage inherited the kingdom of Naples and Sicily, established by Norman adventurers about a century before. The Hohenstaufens retained it until 1265; it was of great injury to the house, because it led the kings to neglect their German subjects. Henry sought to make the imperial crown hereditary, The remaining kings of this line were Philip of Suabia, Frederick II, and Conrad IV. The period is filled with contentions with the popes and the Italian cities, and worse with internal strife. The royal power, even, became insignificant, and neither German Kingdom nor Roman Empire in reality longer existed. Some of the rulers seemed little concerned about Germany, dividing their time between Sicily and the Crusades. Frederick II (1215–1250) was not in Germany for fifteen consecutive years. The last of the Hohenstaufen race, Conradin, was beheaded by Charles of Arjon, who disputed his claim to Sicily. This period is remarkable for the development of church architecture, several great cathedrals being commenced, notably that at Cologne in 1248.

Period III begins with the Interregnum (1254–1273), during which anarchy prevailed in Germany. When the Carolingian line became extinct, the great nobles chose the next king. This right was gradually usurped by a

few of the most powerful nobles, who were called electors. Germany was thus developed into an elective feudal monarchy. After the extinction of the Hohenstaufen line these seven electors (*Kurfürsten*) practically offered the crown for sale. Various bidders appeared, and the two offering the largest bribes were elected, Richard of Cornwall and Alphonso of Castile. Neither gained any authority in Germany. Princes became despots, the nobles robbed and plundered. During this period the towns and free cities grew in importance, and for the protection of trade the Hanseatic and the Rhenish Leagues were formed. The disgraceful scene was finally ended by the election of Rudolf of Hapsburg (1273–1291). He in a measure restored order and royal authority. Rudolf acquired lands in Southeastern Germany, the most important being Austria. This his son Albert received, with the title of duke, and from this dates the rise of Austria and the House of Hapsburg. Adolph of Nassau (1291–1298) was deposed by Albert of Austria (1298–1308). During the latter's reign began the long struggle for independence of the Swiss Cantons. See *Switzerland.* During the fourteenth century and part of the fifteenth there is but little of interest in Germany's history, nothing to which she may point with pride. The imperial crown was passed around from one house to another, and openly offered to the highest bidder, the only care of the electors being to choose a prince not strong enough to endanger their authority. At one time (1410) there were three rival "emperors" ruling simultaneously. The first noteworthy event, besides the revolt of the Swiss, was the promulgation of the Golden Bull (1356) under the Luxemburg emperor, Charles IV (1347–1377). This decree secured to the seven princes (four secular, three ecclesiastical) the right of election, and defined their power. It was in force until 1806. The second was the War of the Hussites, a fifteen years' crusade of extermination against the followers of John Huss, burned at the stake 1415. This movement was a forerunner of the Reformation. In 1438 Albert II of Austria was elected emperor, and the crown was until the dissolution of the empire (1806) regarded as hereditary in the Hapsburg family, although electors always made a formal choice. In the four centuries only two were other than from this house. See *Austria.* The greatest of the Hapsburg emperors in the Middle Ages was Maximilian I (1493–1519) (see art.), a man of bold and generous impulses, but unsuccessful in many of his excellent plans through imprudence and lack of perseverance. He was succeeded by his grandson, the famous Charles V (1519–1556) (see art.), who united the crowns of Spain, the Netherlands, Germany, and Naples. During his reign the Reformation was accomplished, the death of Luther occurring ten years before his abdication. The seeds of civil and political discord sown during the progress of this religious movement were developed, and early in the next century ripened into the Thirty Years' War. Charles was a champion of the Roman Catholic faith, but the

Germany

attitude of the Protestant princes of Germany compelled him to make important concessions. The religious peace of Augsburg (1555) granted toleration to princes, but not to individuals. It was the most fruitful cause of the Thirty Years' War. The successors of Charles were Ferdinand I (1556–64) and Maximilian II (1564–76), under whom the Reformation made great progess, the Protestants being now far the more numerous. The imperial authority, however, declined visibly. Rudolf II (1576–1612) determined to drive Protestantism from his hereditary possessions, and a revolt broke out in Bohemia and Hungary. In 1608 the Protestant states of Germany formed the Evangelican Union, and in 1609 the Catholics, the Holy League. Under Matthias (1612–19) the Thirty Years' War (1618–1648) broke out.

Three provisions of the Peace of Augsburg left much room for tyranny, injustice, and contention. These were: 1, Each prince could choose his state church and drive out all subjects not accepting it. This caused great bitterness among the three sects—Catholics, Lutherans, and Calvinists. See *Calvin.* 2, According to the "Ecclesiastical Reservation," any spiritual prince on becoming Protestant was required to give up office and lands. 3, A provision stating, according to the Catholics, that all lands not secularized in 1552, at the Convention of Passau, should forever belong to the Catholics. The war broke out in Bohemia, where the Protestants were defeated and exterminated,—Bohemian period, (1618–23). This was followed by the Danish period (1625–29), when Christian IV of Denmark championed the cause of the German Protestants, and joined his forces to those of Mansfeld and Christian of Anhalt. Their army of 60,000 was opposed by the armies of the Holy League and the emperor, numbering 70,000, commanded by the famous Tilly and Albert von Wallenstein. See articles on *Tilly* and *Wallenstein, Albert von.* The Protestants were defeated at Dessau and Lutter, and in 1629 Christian IV retired. Their cause now seemed hopeless. The Emperor Ferdinand II (1619–37), who was a zealous Catholic, restored to that church all lands taken from them by the Protestants since 1552. The Swedish period (1630–35) began with Protestant success, due to the reinforcement of 16,000 veteran Swedes under the renowned Gustavus Adolphus (see articles), who was supported by France and England. Tilly, who a short time before had crowned his atrocities with the awful sack of Magdeburg (see *Tilly*), was defeated and slain (1631). Wallenstein, who had been removed from the command, owing to jealousies (1630), was recalled, and in 1632 was defeated by the Swedes at Lüzen, but the victory cost the latter their king. Wallenstein was assassinated in 1634. The war dragged on during the Swedish-French period for fourteen years. It was now European in character, the famous Richelieu secretly encouraging the Swedes, determined to humble the House of Austria. In 1637, Ferdinand III (1637–57) came to the throne. The struggle for spoils finally came to an end

with the Treaty of Westphalia (1648). By its provisions Catholics, Lutherans, and Calvinists were put upon equal footing. A prince could choose the state religion, but non-conformists had three years in which to emigrate. This right of banishment was never exercised to any extent. Germany was cut up into 203 independent states, which owed only a nominal support to the emperor, and which became, in fact, so many petty monarchies. The imperial authority was completely wrecked, and never recovered thereafter. The war had devastated and impoverished Germany beyond measure, all national feeling had been crushed out, and all unity destroyed. She now became the victim of a horde of petty despots, most of whom were worthless and selfish, with the one idea of aping the absolute monarch of France, Louis XIV. The population had been reduced to one third, and civilization and learning were at a standstill. Among the important territorial provisions of the Treaty of Westphalia were the separation of Switzerland and the Netherlands from the empire, and the acquirement of Alsace by France. In the devastating war of the Palatinate (1689–97) this acquisition was increased. See *Louis XIV.*

The interest of German history after the Treaty of Westphalia centers in the rise and fortunes of Prussia. See *Prussia* for details. The great elector Frederick William (1640–88), was already strong enough in 1648 to gain increased territory for his state, and by centralizing authority and forming a standing army, he pushed Prussia rapidly toward the foremost place. His son, Frederick III (1688–1713), added to the title elector of Brandenburg that of king of Prussia (1701), secured with some difficulty from the emperor, as Prussia had become the stronghold of Protestantism, while the house of Hapsburg at Vienna was Catholic. Thus, began the famous house of Hohenzollern, which was to outlive the empire that reluctantly created it and finally determine the destiny of Germany. The emperors henceforth were in fact merely rulers of Austria, and the title of "German Emperor" was but "an empty surname." Leopold I (1657–1705) was succeeded by Joseph I (1705–11), and with the death of Charles VI (1711–40) the male Hapsburg line became extinct. The attempt of Charles to secure, by the "Pragmatic Sanction" his hereditary dominions to his daughter Maria Theresa (see art.) brought on the War of the Austrian Succession (1740–45). After two years' interregnum the electors chose Charles VII (of Bavaria) as emperor (1742–45), and on his death Maria Theresa's husband, Francis I (1745–65), was elected. His successor, Joseph II (1765–90), tried to reestablish the imperial authority in Southern Germany, but was prevented by Prussia. In this kingdom the eccentric Frederick William I (1713–40) had strengthened the power and organized a splendid army of 80,000 men, which proved very useful to his son and successor Frederick the Great (1740–86) (see art.). Under this great ruler, whose generalship was

equaled by his statesmanship, Prussia became the equal of Austria, and showed herself the true center about which the hopes of German unity must cluster. The storm of the French Revolution destroyed the feeble remnant of the empire, and in 1801 Francis II (1792–1806), successor of Leopold II (1790–92), ceded to France the country west of the Rhine. In 1805 several states seceded from the empire, and in 1806 a number of states, including Bavaria, Baden, Würtemberg, and Saxony, formed the Rhenish Confederation under the protectorate of Napoleon. Francis II thereupon formally resigned the German crown, and the Holy Roman Empire ceased to exist. Napoleon's plan to add Germany (or at least the states of the Rhine Confederation) to his empire was frustrated by the "Battle of the Nations" at Leipsic (1813) where Russia, Prussia, England, and Sweden were united against him, and two years later Blücher, with his 30,000 Prussians, sealed his fate at Waterloo.

At the Congress of Vienna which met to restore order out of the chaos into which European affairs had been plunged, the German states were organized as a confederation, with the emperor of Austria as president. Prussia, whose ruler was now Frederick William III (1797–1840), received one third of Saxony, because the latter had supported Napoleon. The several states were independent in internal affairs; interstate disputes were to be settled by a diet. Each state was to have a constitutional form of government, but this provision was little observed until the effect of the French revolutions of 1830 and 1848 forced the German rulers to accede to their subjects' demands. About 1830 was formed the Zollverein, or commercial union, securing free trade among the several states. In 1848 a National Assembly met at Berlin for the purpose of framing a national constitution, but the rivalry of Austria and Prussia prevented any successful results. In Berlin there was a serious uprising about this time, quieted only by the promise of Frederick William IV (1840–61) to give a constitution, which he did in 1850. This king was succeeded in 1861 by William I, afterward famous as Kaiser Wilhelm I (1861–88). See art. Into his ministry was soon called Count Otto von Bismarck (see art.), whose "policy of blood and iron" was to make possible the firm and final union of the German nation. The rivalry between Prussia and Austria continued, in no way discouraged by Bismarck, who was making ready for the struggle he knew would come. The last of a series of irritating causes was the contention over Schleswig-Holstein, which had been wrested from King Christian IX, of Denmark. The war began in 1866. Austria had as allies most of the smaller states. Prussia had Italy. After compelling Saxony and some other states to remain neutral, the Prussian army rapidly marched southward, under the great von Moltke, and on July 3, 1866, met the Austrians at Sadowa, in Bohemia, and utterly routed them. The Prussians pushed toward Vienna, and August 23, the Austro-Prussian War was

ended, having lasted about seven weeks. The North German Confederation was formed (1867), with the king of Prussia as president. The Catholic states of the South — Bavaria, Baden, and Würtemberg—held aloof, but just before the close of the Franco-Prussian War (1870–71), they eagerly joined the Confederation. The cause of this war was the hatred and jealousy with which France viewed the rising power of the Hohenzollerns. The occasion was the offer to Leopold, a member of the family, of the crown of Spain, which was declined. The Emperor Napoleon III, however, rudely demanded King William's pledge that no member of his House should ever become a candidate for the Spanish throne. The demand was refused, and the French armies at once invaded Germany, but were driven back and pursued by the Prussians and their allies. The chief battles of this short war were at Gravelotte (Aug. 18, 1870), Sedan (September 1) —where the French emperor was captured— followed by the capture of Strassburg and Metz, and finally, after a few months' siege, by the capitulation of Paris, Jan. 28, 1871.

By the treaty which followed, France lost Alsace-Lorraine, and was compelled to pay a large indemnity. The most important result to Germany, however, was the enthusiasm and the spirit of nationality awakened in every state by the success of the Prussian arms. Scarcely had the German Confederation, to include all the states, been formed, when it was changed to the German Empire, and William I, king of Prussia, was proclaimed emperor, at the palace of Versailles, Jan. 18, 1871, the siege of Paris being still in progress. The honor was to be hereditary in his family, and on William's death, descended to his son, Frederick III (March 9–June 15, 1888). This prince had shared his father's great victories and was a favorite with the German people, who deeply lament his early death. He was succeeded by his son, William II (b. 1859), grandson of Queen Victoria, who is the present emperor (1897). William at once showed his intention to reserve to himself personal control of the government, and accordingly dismissed Bismarck (March, 1890), who did not approve of his policy. In the last few years the Social Democrats have been heard with considerable emphasis in Germany. Since 1884 several foreign dependencies and protectorates have been acquired in Africa and Oceanica. Germany is a member of the Triple Alliance, which includes Austria-Hungary and Italy. It was formed about 1883, chiefly through the efforts of Bismarck, and was intended as a defense against Russia and France. The best handbook in English is Lewis's *History of Germany* (Harpers). The Triple Alliance was renewed by Chancellor Caprivi, the successor of Bismarck, in 1891. In 1890 he secured Heligoland from England in exchange for German claims in Zanzibar and Witu. Emperor William II, on April 15, 1890, announced the appointment of Gen. Leo von Caprivi de Caprera to succeed Bismarck as chancellor and premier of the council. There was a general feeling that

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Bismarck's retirement would be an impediment to the national growth and prosperity of the empire. As a matter of fact this feeling had no foundation, for it was announced by Caprivi that he would continue so far as possible the government principles of Bismarck. An action of doubtful expediency was the abolition of the official press, but even this was, on the whole, favorably received. Events of importance during the years 1890–91 were, the meeting of the International Labor Congress in Berlin; the ratification of the Samoan treaty with the U. S.; the extension of the triple alliance for three years; the initial step in the imperial agitation for an increase in the army; and the celebration of the anniversary of the birth of the great stategist, Count von Moltke, and his death shortly afterward. April 1, 1891, was Bismarck's birthday and was a time of great rejoicing throughout the empire. The "Iron Chancellor" was the recipient of a note of congratulations from the emperor, which act was greeted with approval by all. The emperor's visit to England and Russia had the significant result of establishing existing friendly relations more firmly. Aug. 10, 1891, the twentieth anniversary of the restoration of the empire was celebrated, and on Sept. 21, the severe passport regulations applied in Alsace-Lorraine were relaxed. Early in 1892 Emperor William advocated the passage of a primary education bill compelling children to be instructed in religion. This bill met with pronounced opposition and was withdrawn. On the occasion of the marriage of Count Herbert Bismarck, at Vienna, June 21, 1892, the ex-chancellor was refused an audience by the Emperor of Austria. This affront was strongly resented by Bismarck, and attributed by him to the influence of Emperor William. The emperor was publicly reproached by the conservatives and there was some talk of treason. Thus the breach between the emperor and Bismarck was widened. The "Guelph fund" consisting of about $12,000,000 and representing the value of the estates of the king of Hanover, was turned over to the duke of Cumberland. The empire was greatly agitated by the discussions of the army bill. It was proposed by the government that there should be an additional taxation and an increased number of recruits. A bill to this effect was introduced and after many amendments was finally rejected by the Reichstag May 6. The emperor called a new election and the bill was passed by a small majority in July. The decree against the Jesuits which expelled them from the empire in 1873 was repealed Dec. 1. In January of the following year occurred the reconciliation of the Emperor William and Bismarck, and it was an occasion of much rejoicing. There was a disagreement between the emperor and Chancellor Caprivi in regard to the methods of repressing the socialists, which resulted in the resignation of the latter Oct. 26. Prince Hohenlohe-Schillingsfurst succeeded him to the chancellorship, and with his ministry came the revival of the anti-revolutionary measures against so-

cialists and anarchists. Quite an excitement was occasioned in the new parliament house on December 5, by the refusal of the socialists to cheer the emperor. This act was considered treasonable by many, but nothing serious came of it. The corner-stone of the new Parliament building was laid in 1884 by Emperor William I. This is the finest structure in the empire, and cost over $7,000,000. The anti-revolutionary bill was rejected by the Reichstag in Jan., 1895. The celebration of Bismarck's eightieth birthday, April 1, brought delegates from all parts of the empire. The Kaiser Wilhelm canal was opened in the presence of representatives of the governments of the world on June 19. This canal connects the Baltic and North Seas; its cost was over $39,000 000. Other events of importance which occurred in this year were, the celebration of the twenty-fifth anniversary of the surrender of the French, August 18; the enaction of retaliatory measures against the U. S. for the duty placed by the latter on German sugar; the enforcement of prohibitive acts against American beef, and the prevention of American insurance companies from doing business in Germany. The twenty-fifth anniversary of the founding of the empire was celebrated as a national holiday Jan. 18, 1896. Local political disturbances were quite numerous the first part of the year, but nothing of import took place until Aug. 7, when Hohenlohe resigned the chancellorship. There were none other than personal reasons for Hohenlohe's retirement. Within the last few years Germany has been one of the most prosperous countries of Europe. Great internal improvements in all directions have been made; her international relations have been greatly strengthened; she has satisfactorily demonstrated and enforced her military power; her navy has been thoroughly reorganized; by treaties with France the German possessions in Africa have been clearly defined, and the people, as a whole, are prosperous and contented. The number of political parties has increased; the socialists have gained in power, and the agrarian movement forced recognition. Toleration both in religion and politics has greatly increased. But while the emperor had done much for the empire, he did not strengthen monarchy by his insistence on his divine right to rule. In a speech at Koningsberg, Sept., 1894, he warned the nobility not to go too far in their opposition to the government, vehemently denounced the socialists, and closed one of his periods with the remarkable words: "So do I, like my imperial grandfather, represent the monarchy by right divine." The storm which this aroused resulted in the suppression of several socialist papers, the plant of the principal organ in Berlin being seized and confiscated. The socialist headquarters thereupon removed to Hamburg, out of Prussian jurisdiction. After the reconciliation with Bismarck, however, public sentiment turned in favor of the emperor. Bismarck, the "Iron Chancellor," d. at his home at Friedrichsruhe, July 30, 1898.

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In November, 1897, a few German missionaries were murdered in the province of Shan-Tung. The onslaught was said to have been instigated by the Chinese manderins and priests, and planned by the governer of the province. The omission of the Chinese government to make immediate amends caused Germany to send four warships to the port of Kiao-Chou. On November 15 six hundred marines were landed with several pieces of artillery, The garrison of the Chinese forts fled, and the Germans hoisted their imperial flag over the forts. Germany demanded punishment of officials implicated; reconstruction of the mission buildings; payment of an indemnity to the relatives of the victims; payment of a heavy indemnity to cover the expenses of the German naval expedition, and of maintenance of the German force at Kaio-Chou.

Language.—The history of the German language is divided into three parts—Old High German (to 1100 A. D.), Middle High German (1100–1500), New High German (1500–). The limits are approximately the same as those assigned to the three periods of the English language. The word "high" in each case has a purely geographical significance. In the earlier periods of the language, the dialects of South Germany are designated as High German, from the more mountainous character of those districts, while the language of North Germany is called Low German. The dividing line is placed approximately at a point a little n. of Cologne, thence running e. through Cassel, Wittenberg, and s. of Frankfort-on-the-Oder. The Low German dialects were spoken in the periods referred to as well as the High, but the works of literature preserved belonging chiefly to the latter dialects, the whole period is so characterized. By examination of dialectical peculiarities, scholars are able to locate specimens of literature from those periods with considerable exactness. In the same way today a German peasant's native province can be approximately determined. The dialectical peculiarities which the printing press and a uniform educational system have obliterated in a great measure in the spoken language, especially in the last generation, still survive in the more isolated districts, and it is quite possible to find two peasants from different parts of Germany who cannot make themselves understood to each other. In modern printed German there are no considerable variations, but in speech even the educated will usually betray their dialect in some peculiarity of pronunciation or vocabulary. The most powerful agency in fixing a common written language for Germany was Luther's translation of the Bible (1522), and this is conveniently made the beginning of the New High German period. The fact that this work had a wide circulation made its dialect, which was intermediate in character and geographical position, familiar throughout Germany, and subsequent writers who wished to reach a large circle of readers naturally employed it. The first German grammar appeared in 1540, and subsequent grammars and dictionaries gradually fixed the

forms of the language. The progress toward a uniform standard was slow, and the perfection of the language was not attained until the eighteenth century. The progress, as in the history of every language, was toward simplification of inflection and complication of syntax. Old High German, for instance, had twenty-five endings in the noun inflection, while Modern German has but seven. The vocabulary has been modified and enriched. Many of Luther's words, even, are now archaic. The poetic side of the language was especially rich in the M. H. G. period. During the sixteenth century Latin words were added, chiefly technical terms. In the period of French supremacy in Europe and French influence at the German courts, many words from that language came into the vocabulary. The "purists" object to these, partly on patriotic grounds, but many have become naturalized members of the language. The vocabulary at the command of a writer wishing to use only "pure German" is, however, remarkably large. The language is especially rich in words expressing the emotions, and its spirit is in admirable harmony with that of the people using it. The almost unlimited power of forming compounds from simple words gives to a German sentence a formidable appearance, but really simplifies the understanding of the language in a large degree; particularly for moderately educated natives. The German alphabet is substantially the same as the English, with modifications of orthography and pronunciation. A characteristic is the "Umlaut," a modification of the vowels *a*, *o*, *u* in the direction of *e;* umlauted vowels are transliterated by writing this letter after them, e. g., Müller—Mueller. The grammar is more complicated than the English by reason of the fuller inflection and conjugation. There are four cases (the dative being retained) and three genders; and the articles, pronouns, and adjectives have full declensions throughout. The plural has identical forms for all genders, except in personal and possessive pronouns. The gender of nouns is not natural, and apart from the rules as to endings and classes of words, must often be learned by observation. There are three possible forms of the plural, with or without the umlaut. Adjectives have two distinct declensions, strong and weak, according to what immediately precedes them. Prepositions and verbs govern three cases. Verbs are strong or weak according (in general) as the preterite is or is not formed by means of Ablaut, i.e., vowel-change. The word order is involved, especially in dependent classes, and subject and verb are sometimes far removed from each other. Inversion is common, and adds emphasis.

Literature.—The significance of Old, Middle, and New High German, as applied to the language and literature of Germany, has been explained in the preceding paragraph. The earliest limit of O. H. G., as separate and distinct from Old Low German, may be approximately placed at 600 A.D. About this time the Germanic national epic attained its highest

perfection. From the Anglo-Saxons we fortunately have the *Beowulf*, but of the O. H. G. epic no trace remains. Charlemagne is known to have made a collection of national songs, but it has never been found. About 1200 came what is commonly called the First Classical Period, the Age of the Minnesingers, and about 1800, again after an interval of 600 years, came the Second Classical Period, which culminated in Goethe. Likewise 600 years apart are the periods of greatest literary depression, 1000 and 1600. The oldest Germanic work of which we have remains is the translation of the Bible by Ulfilas, bishop of the Goths (350). During the migration of the Germanic tribes (beg. 375) five cycles of legends arose, traces of which are preserved in the *Nibelungenlied* and other M. H. G. epics. The earliest fragment of the O. H. G. literature is the *Wessobrunner Gebet*, a religious poem beginning with an account of chaos and ending with a prayer (c. 800). Choral songs were common for weddings, funerals, and on marching into battle. Riddles and charms were also in vogue. The earliest fragment having literary merit is the *Hildebrandslied*, by an unknown monk early in the ninth century. It tells of a combat between Hildebrand and Hadubrand, father and son. The story was known to Eastern nations in a little different form. The father recognizes his son, and seeks to avoid the combat, but Hadubrant believes his long-absent father dead, and will not desist. We have not the end of the story. The *Ludwigslied* (c. 930), celebrated the victory of Ludwig III over the Normans. A very interesting fragment is *Muspili* (850), which describes the destruction of the world by fire and depicts the pains of hell and the joys of heaven. Otfrid of Weissenburg (870) wrote the *Krist*, or *Gospel Harmony*, an account in rhyme of the Messiah, wholly Christian in character. The earlier German verse is alliterative. In the *Heliand*, a Low German poem on the same subject (830), Christ is represented as a warlike hero. The monasteries were the centers of learning in Germany, and here the monks wrote in Latin or translated from the Bible; so the *Tatian Gospels* and Notker's version of the Psalms. The glory of the 150 years (1150–1300) known as the Second, or M. H. G. Classical Period, was due to a combination of causes. The spirit of chivalry and the glory of the Hohenstaufens aroused the national feeling, and the Crusades, aside from their religious character, awakened a romantic enthusiasm. Royal patronage encouraged the poets, and the introduction of French models gave them material. To the Transition Period belong the *Rolandslied* (c. 1130) and the *Alexanderlied*, the first a translation of the *Chanson de Roland*, the second after a French poem on the famous Macedonian king. Both are modified and adapted to suit the German poets. To the songs of wandering minstrels, the German "Troubadours," belong *König Rother* and *Herzog Ernst*. To this early period also belongs the satiric humorous tale of *Reynard the Fox*. The poetry of the Minne-

singer is divided into *Popular Epics* and *Court Epics*. The former dealt with great national heroes and legends, the latter with subjects from French and classical models. The first are the work of unknown authors, who may have been merely collectors of popular songs; the second are by professional poets of the court, working under royal patronage. The great monument of the Volksepos is the *Nibelungenlied* (see art.), whose hero is the noble Siegfried. The theory of plurality of authorship, as in the case of the Homeric poems, is probably correct, inasmuch as parts of the poem differ widely in character and excellence. Closely connected with the *Nibelungenlied* are the Old Norse heroic lays of the older Edda and the *Völsunga Saga*, which tell much that precedes the opening of the German epic, and alone interpret certain incidents and motives. The *Nibelungenlied* as a whole probably belongs to the years 1190–1210; the songs may have gone back six centuries. The second great poem of the Volksepos is the *Gudrun*, the work of one poet, probably an Austrian, about 1190. It is a beautiful and touching story of the patient suffering and unwavering fidelity of the heroine, Gudrun, who after long captivity is at last restored to her lover and her people, and is a noble tribute to Germanic womanhood. It has more of humanity but less of tragic grandeur than the *Nibelungenlied*. About Theodoric, king of the Ostrogoths, a number of minor epics were grouped. The sources from which the court poets drew were: 1, the British Legend of King Arthur and the Knights of the Round Table; 2, the Spanish Legend of the Quest of the Holy Grail; 3, the Legends of the Trojan War and of Alexander the Great; 4, the French Legends of Charlemagne.

The chief writers of "Höfisches Epos" are: 1, Wolfram von Eschenbach (d. 1220), by far the greatest of these poets, by reason of his fidelity to nature and depth of thought. His famous *Parzival* unites the Arthurian and the Spanish legends of the Grail. It is full of religious feeling, toleration, and broad humanity. *Titurel* is fragmentary, and tells of Parzival's great-grandfather, first king of the Grail. 2, Hartmann von Aue, a Suabian, who was in the Crusades of 1189 and 1197. His chief works are: *Ereck und Enite* (cp. the story of *Geraint and Enid*, in Tennyson's *Idylls*); *Iwein, or the Knight of the Lion*, the story of a knight who loses his lady's love while riding abroad, but at last recovers it. *Der Arme Heinrich*, an old tradition which Longfellow has told in his *Golden Legend*. Heinrich is a leper who can be saved only by the voluntary sacrifice of a maiden. When the maiden appears, his better nature refuses to permit the sacrifice, and his resignation is rewarded with a miraculous cure. 3, Gottfried von Strassburg's chief poem is *Tristan und Isolde*, adapted from a French account of King Arthur's knight, (cp. Tennyson's idyll, *The Last Tournament*). Gottfried has genius, but is inferior in ideals and conception of character. 4, Heinrich von Veldeke (c. 1184) was the author of an *Aeneid*, based on a French translator of Virgil. Of the minor court poets, Konrad von Würzburg, (d. 1287), is known as the author of the *Swan Knight*, the modern *Lohengrin*. The *Minnepoesie* (love poetry) includes the court lyrics *Höfische Lyrik*, and among its founders is Heinrich von Veldeke, who gave it a purer rhyme. The subjects of the Minnegesang are: 1, love, the service of woman; 2, religion, the service of God; 3, politics, the service of feudal lords. The greatest of the Minnesinger is Walther von der Vogelweide (1160–1227), mentioned, along with Wolfram, as one of the poets at the famous *Wartburg Sängerkrieg* of 1204. See *Wartburg*. Walther's political songs were very popular. His verses are of love, religion, his own life; but whatever the subject his genius and true poetic touch are evident. He has been called the greatest lyric poet of Germany before Goethe. The most prominent names during the decadence of the *Minnegesang* after Walther's time are Heinrich von Meissen, called *Frauenlob* because he preferred the word *frau* to *weib*, and Ulrich von Lichienstein, who wrote *Frauendienst*, a mild satire on chivalry in the form of personal memoirs. The two centuries following the glorious period of the Minnesingers were almost barren of literary production. Royal patronage was withdrawn, and the general condition of the people was most unfavorable. It is to be noticed that German came to be more and more the language of sermons during this period. Here, too, belongs the rise of the German drama, which, like the English, began in mysteries, moralities, and miracle plays; the comic element, the *Hanswurst*, was gradually developed. The *Animal Epic* again appeared at the end of the fifteenth century. The 200 years cover several important events, however, which show that the German intellect was not asleep. Schwarz invented gunpowder (1554), Gutenberg the art of printing (1440), and newspapers were established (1488). In 1348 the first university was founded, at Prague, and by the beginning of the sixteenth century their influence was considerable. The successors of the Minnesingers were the Meistersingers, no longer nobles and courtiers, but plain artisans, who founded metrical schools, similar in constitution to the trade guilds, in which there were five grades from *Schüler* to *Meister*. Originality in metrical form was greatly sought after. The most famous of the Meistersingers is the shoemaker-poet, Hans Sachs, remarkable for the quantity and variety of his writings rather than for their quality. From 1513–67 he wrote 208 plays and 4,276 *Meistergesänge*. Sebastian Brant's *Ship of Fools* (1494) is a long didactic poem. Thomas Murner's *Narrenbeschwörung* (1512) is of a similar character; his satire, *Concerning the Great Lutheran Fool*, belongs to the Reformation literature. The poems of Fischart (d. 1589) are humorous and satirical, somewhat after the manner of Rabelais. The great name of this period is Martin Luther (1483–1546). See article. Besides his translation of the Bible, Luther wrote sermons and polemics, and es-

pecially hymns, whose excellence has never been surpassed in Germany.

During the seventeenth century several societies were founded for the purification of the German language and the fixing of a grammatical standard. The so-called First Silesian School of Poetry strove after pure diction and simple treatment. The most important writer of the school is Martin Opitz (1597–1639), author of a German *Art of Poetry*. His disciple Paul Flemming had more original poetic genius. The writers of the Second Silesian School are bombastic and extravagant. Sharing the characteristics of both schools is Andreas Gryphius (1616–64), the principal German dramatist before Lessing. In him a slight reflection of Shakespeare's influence is perceptible. One of his tragedies is *Karl Stuart von England*, he treats the king as a martyr. *Horribilicribrifax* is a comedy whose humor depends upon the employment of words from various languages in the dialogue, causing great confusion. The legend of *Dr. Faustus* appears in crude dramatic form during this period. Novels and romances were numerous, including many imitations of Defoe's *Robinson Crusoe*. Grimmelshausen's (1625–76), novel, *Simplicissimus*, gives a graphic picture of Germany during the Thirty Years' War. A preacher of the time, famous for his wit and eloquence, was Abraham á Santa Clara (d. 1709). The most famous literary man of the first half of the eighteenth century was Johann Christoph Gottsched (1700–66), a professor at the University of Leipsic. He was an able scholar, and the best philologist before Grimm; he compiled a grammar of some merit, and wrote a *Critical Art of Poetry*. Gottsched founded literary societies and publications, directed the Leipsic theater, for which he and his wife translated many French plays, and assumed the censorship of all publications. His chief fault was obstinate adherence to the form and style of French classicism, without reference to its adaptability to the German spirit. His service was the purification of the German drama and language, accomplished by banishing what was coarse, and following the refined French models. The period of imitation was necessary, but Gottsched failed to see when the necessity had passed. His principal original drama is *The Dying Cato*, in imitation of Addison's *Cato*. Gottsched became involved in literary disputes, and lost prestige and respect. See also *Lessing*. His most important dispute was with Bodmer and Breitinger (d. 1783 and 1776), of the Swiss School, who advocated imitation of English models as exemplified in Milton. *Paradise Lost* was translated by Bodmer. Gellert (1715–69) is chiefly remembered by his excellent *Fables*, the style of which is easy and graceful, after the manner of Lafontaine. Haller and Hagedorn wrote odes and songs in vigorous and elegant diction, the former after English models, the latter French. Glein (1719–1803) and Ewald v. Kleist (1715–59) wrote stirring lyrics reflecting the glorious military period of Frederick the Great. Kleist's *Spring* in the style of Thomson's *Seasons* was a favorite poem. One of the great eighteenth century poets is Fredrich Gottlieb Klopstock (1724-1803), author of the *Messias*, a religious epic inspired by *Paradise Lost*. The first three cantos are by far the best portion of the work. The sublimity and lofty sentiment of Klopstock's style are marred by the poet's excessive sympathy. His creations are too ethereal, have too little that is human, to hold the reader's interest effectively. Parallel with Klopstock's life was that of Immanuel Kant, the great philosopher. Christoph Martin Wieland (1733–1813) was a poet of great culture and varied experience, at one period of his life extremely pious, at another quite the opposite. His *Oebron* is a masterpiece, and reckoned among the German classics. It is a beautiful tale of fairy-lore and recalls *Midsummer Night's Dream*. His novel *Abderiten* is a satirical protest against *Philistinism*. The journal *Der Deutsche Merkur* satirizes German manners and customs. To this Goethe contributed. Wieland did much for the German drama by translating Shakespeare. The *Göttinger Dichterbund* or *Hain* was a group of young poets characterized by extravagance and unrestrained vitality and realism. Chief of the members are: Bürger (1747–94), author of *Lenore* and *Der Wilde Jäger*, translated by Scott, and other popular ballads and songs. Voss (1751–1826), author of odes and idylls, chief of which is *Luise*.

By far the greatest writer of the middle eighteenth century is Lessing (see art.), the first of the three great names in the Second Classical Period. He wrote the best comedy and the best tragedy that had yet appeared, reformed literary criticism, and elevated German style. It was Lessing, "the pioneer," who made the later glories possible. Johann Gottfried Herder (1744–1803) was a man of fine culture and vast learning. He is famed chiefly for his scholarly criticism and investigation. His linguistic talents enabled him to bring within reach of German scholars the treasures of other lands. Especially did he study the songs of the nations, *Stimmen der Völker in Liedern*. Herder was an earnest student of the early history of mankind and the origin of their language, *Die älteste Urkunde der Menschheit*, and *Uber den Ursprung der Sprache*. In *Der Cid* he adopted Spanish romances. His literary and æsthetic criticisms are numerous and valuable. Herder was long associated with Goethe, whom he greatly influenced. The *Storm and Stress* (*Sturm und Drang*) group includes a few minor poets, such as Klinger and Schubert, but above all belong here the early writings of Goethe and Schiller, notably *Götz von Berlichingen* and *Die Räuber*. The interest of the Second Classical Period centers in Goethe and Schiller (see articles), whose names are inseparably linked, even as in life was their genius. Parallel with the classicism of Goethe's maturity and old age is the so-called Romantic School. The poets of this school are extremely subjective, give the imagination full play, and recognize no limitations. Of the older Romanticists the poet Novalis and the novelist Tieck (1773–1853), together with the brothers Schlegel, are

most famous. Aug. Wilh. v. Schlegel (1767–1845) is noted as a literary critic, and especially as the best translator of Shakespeare. His brother Friedrich (1772–1829) rendered great service to linguistic science in his investigation of the Sanscrit tongue of Ancient India. Jakob Grimm (1785–1863) and his brother Wilhelm (1786–1859) spent their lives together in the most valuable linguistic investigations. The great dictionary begun by them will be when complete the largest in any language. They compiled the *Kinder und Hausmärchen*, the book of fairy tales which has made their names familiar the world over. Jean Paul [Richter] (1763–1825) was a prolific writer of novels, the best of which are *Titan* and *Flegeljahre.* His able satire and humor, and his patriotic defense of liberty made him a great favorite in Germany. Clemens Brentano (1778–1842) collected German songs and ballads into *Des Knaben Wunderhorn.* His brother-in-law, Achim von Arnim (1781–1831), was a novelist eager to re-establish the earlier popular style in German literature. A novelist of great imaginative and realistic powers is Ernst Theo. Hoffmann. Fouqué (1777–1843) is especially famous as the author of the beautiful fairy tale, *Undine.* Platen (1796–1835) was a poet of great talent. whose verses are remarkable rather for form than quality. Two Austrian poets are prominent, Grillparzer and Lenau. Chamisso (1781–1838) is a master of simple, natural pathos, sometimes bordering on the sensational. His *Frauen-Liebe und Leben*, a poem, and the story of *Peter Schlemihl* are among his best known works. Joseph von Eichendorff (1788–1857) was the author of a most charming little story, *From the Life of a Good-for-Nothing.* Immermann's (1796–1840) best works are *Münchhausen* and the dramatic myth, *Merlin.* Körner and Heinrich v. Kleist were promising poets whose genius was cut short by early death, the former on the battlefield, the latter by suicide.

The greatest of the Romantic poets is the unhappy Heinrich Heine (see art). The Suabian poet Ludwig Uhland (1787–1862) was the author of many popular ballads and songs, as *Des Sängers Fluch.* Hoffman v. Fallersleben (d. 1874) and Ferdinand Freiligrath (d. 1876) are favorite poets of recent times. Friedrich Rückert's (d. 1866) best work was done in his youth. Two writers have dramatized with fair success, the *Nibelungen* story, Friedrich Hebbel (1813–63) and Emanuel Geibel (1815–84). Wilhelm Jordan (1819–) has merged the Norse and the German versions into a beautiful epic. The novelist and dramatist Karl Gutzkon (1811–78) voices eloquently the plea for liberty and toleration. Of the modern novelists Gustav Freytag (1816–95) is perhaps the best known. His *Soll und Haben* (*Debit and Credit*) is a delightful story of German *bürgerleben.* Other valuable works are *Die Verlorene Handschrift*, the culture-historical series of novels *Die Ahnen*, and the charming history of German civilization in his *Pictures from Germany's Past.* Freytag is also the author of the best modern German comedy *Die Journalisten.* Jos. Viktor von Scheffel (1826–86), wrote the best historical novel in German, even if the picture is not true to fact, viz., *Ekkehard;* the hero was a St. Gall monk of the tenth century. Scheffel's beautiful idyll *Der Trompeter von Säckingen* is much read. Another well-known historical romance is Hauff's (1802–27) *Lichtenstein.* George Ebers (b. 1837) is an Egyptologist as well as novelist, as appears in such works as his *Egyptian Princess*, *Bride of the Nile*, and *Serapis. Homo Sum* is, perhaps, his best. Berthold Auerbach is best known by his *Dorfgeschichten* and *Auf der Höhe;* Wilhelm Raabe by his *Chronik der Sperlingsgasse.* Friedrich Spielhagen (b. 1829) is a man of pronounced and earnest democratic opinions, which sometimes appear in his novels. Best known are his *Problematical Natures* and its sequel *Through Night to Light;* also his *Hammer and Anvil.* Paul Heyse (b. 1830 became famous through his *Kinder der Welt*) and *Im Paradiese.* Of his later works *Anfant gund Ende* and *Nerina* may be mentioned. Heyse's novels, for the most part, picture the unhappier, or rather the weaker, side of social life, Fritz Reuter (1810–74) holds a warm place in the hearts of the Germans. His poems and tales which are written in the picturesque Plattdeutsch, are full of exquisite, healthy humor. *Ut mine Stromtid* is his masterpiece. Two favorite Swiss writers of German fiction are Gottfried Keller and Konrad Ferdinand Meyer. The latter's historical tales are especially admirable. Among the important poets of recent years should be mentioned Richard Wagner, whose poetic talent has been overshadowed by his great musical genius.

Germination, the first act of growth by an embryo plant. The immediate causes of germination are the presence of moisture and atmospheric air and a certain elevation of temperature. Moisture softens the integuments of the seed and relaxes the tissue of the embryo; atmospheric air supplies oxygen and nitrogen; and a temperature which must be at least as high as 32° F., by exciting the vitality of the embryo, enables it to take advantage of the agents with which it is in contact. During germination various changes take place in the chemical constituents of the seed, and are usually accompanied with increase of temperature, as is seen in the process of malting. Along with these other changes commonly take place: a root is produced, which strikes perpendicularly downward and, fixing itself in the soil, begins to absorb food; a growth upward then commences and ends in the protrusion of a stem and leaves.

Germ Theory of Disease, the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the afflicted person by the air, or food, or drink, and which, growing and multiplying in the body they invade, produce the changes characteristic of the particular disease. The period during which the living particles of contagious matter retain their vitality, like the rate of their growth and multiplication, varies in different cases. but it is limited in

all. Few, if any, resist the destructive influence of a temperature of 300° F., while most succumb at the temperature of 200° or even less, particularly if exposed for some time. Animal poisons generally are destroyed by boiling, and clothes, sheets, etc., infected, may be rendered pure by being exposed to a temperature of 300° F. These living organisms are grouped together as microbes or micro-organisms, and are divided into different classes. The *micrococcus* is a round form about the 32,000th of an inch in size, and multiplies by fission. The *bacterium* is rod-shaped, about the 10,000th of an inch long, with rounded ends; it also multiplies by fission. The *bacillus* is a third form also rod-shaped, and somewhat larger than the bacterium. They often form long chains or threads, and increase by division and by spore formation. *Vibrio* and *spirillum* are somewhat similar forms; and, like the others, increase with a rapidity beyond conception. The connection between these micro-organisms and the various forms of zymotic disease has been thoroughly established. The only method of investigation that yields reliable results, is to separate the organism supposed to be the cause of the disease, and cultivate it outside of the body. Thus a drop of blood from a person suffering from a special disease, which contains the bacteria, or bacilli, etc., believed to be the producers of the disease, is placed in a flask containing a nourishing material, care having been taken to destroy all other organisms in the flask. The special microbe flourishes there, let us suppose. It is then cultivated in one flask after another through successive generations, only a single minute drop of the material in one flask being used to inoculate a succeeding one. In this way a pure cultivation is obtained, a cultivation, that is, containing the particular microbe and none other. If this is the true cause of the disease, then a drop of the solution containing it introduced into the body of an animal capable of the disease, ought to produce it, and the particular organism introduced should be found multiplying in the blood and tissues of the infected animal. Such a demonstration has been given of the cause of a few diseases.

Doctor Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the bacillus organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist, Pasteur, proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Doctor Koch, of Berlin, announced the discovery of a micro-organism in tuberculosis, a disease believed to be the chief, if not the only, cause of consumption of the lungs. These microbes are found not only in the lungs of persons who have died of tubercle, but also in the spit of tubercular and consumptive patients, and multiply also by spores. Thus it is that the spit of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air. After the epidemic of cholera in Egypt in 1883, which spread to France and Italy, investigations were undertaken by French, German, and British commissioners. Doctor Koch detected a peculiar bacillus, shaped like a comma (,) in the intestines of persons who had died of cholera, in the discharges from cholera patients, etc. He believed that this bacillus was the active agent in the production of the disease; but other authorities were unable to accept Doctor Koch's view that the comma-bacillus was the cause of the disorder. All investigation, however, seems to point to the fact that every infectious or contagious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has gained entrance to the body. The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. The "germ theory" affords the hope and suggestion of a method of diminishing, if not of getting rid of, such diseases altogether, and to some extent also indicates the direction in which their cure is to be sought. If the particular microbe of each contagious disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested, and the disease thus cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of contagious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease.

Gérôme (zhā-rōm), Jean Léon, a French painter, b. in 1824 at Vesoul. He went to Paris and studied under Paul Delaroche. In 1853 he traveled in the East. In 1855 the first of his great pictures, *The Age of Augustus* and the *Birth of Christ*, appeared, and four years later his picture of the Roman gladiators, *Ave Cæsar Morituri te salutant.* In 1861 he exhibited his celebrated *Phryne before her Judges.* In 1863 he was appointed a professor at the École des Beaux-Arts. His works are in great favor in England and the U. S. as well as in his native country.

Gerry, Elbridge (1744–1814), American statesman, was b. in Marblehead, Mass., graduated at Harvard in 1765, and was elected to the Massachusetts Assembly in 1773. He was a member of the Continental Congress of 1776, and served on several important committees, and in 1789 the Republican party elected him to the first National Congress. He was one of the envoys sent in 1797 to establish diplomatic relations with France. His colleagues, Marshall and Pinckney, being Federalists, were ordered to quit France, but Gerry was permitted to remain; and he did remain, to the indignation of Americans, until his recall was ordered. Elected governor of Massachusetts in 1810, Gerry, who was a keen parti-

san, removed the holders of civil offices and replaced them with Republicans; and he unfairly rearranged the districts of the state so as to secure the advantage to his own party—a maneuver for which his opponents coined the word *gerrymander*. He was defeated in 1812, but his party rewarded his zeal by electing him to the vice-presidency of the U. S., in which office he died.

Gerstäcker (ger'stek'ėr), FRIEDRICH (1816–1872), a German traveler and novelist. In 1837 he came to America, where he earned a living by the most various employments—as a sailor, stoker, innkeeper, woodcutter, and trapper and hunter in the prairies of the West. He returned to Germany in 1843, and began his literary life by the publication of his experiences in America. In 1849 he was engaged on behalf of the German government to collect information which might be useful to German emigrants. The results were published under the title of *Reisen* in 1853.

Gervi'nus, GEORG GOTTFRIED (1805–1871), a German critic and historian, b. at Darmstadt. In 1835 he was appointed extraordinary professor at Heidelberg, and the following year ordinary professor of history and literature at Göttengen; but in 1837, being one of the seven professors who protested against King Ernst August's breach of the constitution, he was banished from Hanover. After a visit to Italy he returned to Heidelberg, where in 1844 he was appointed an honorary professor. He became editor of the newly-founded *Deutsche Zeitung*, and was returned to the Federal diet by the Hanse towns. In 1849 he published the first part of his great work on Shakespeare.

Gesner (ges'nėr), KONRAD VON (1516–1565), German scholar, b. at Zürich. He did important work in the departments of history, zoology, and botany. His *Bibliotheca Universalis* is a descriptive catalogue of all writers extant in Greek, Latin, and Hebrew. His *Historia Animalium* must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers.

Gessner (ges'nėr), SALOMON (1730–1788), a German poet and artist, was b. at Zürich. His *Daphnis*, a small volume of idylls, acquired for him a great reputation among contemporaries. For some years he devoted himself to the engraving art, in which he became very eminent.

Gethsemane (geth-sem'a-nē) ("oil press"), an olive garden or orchard in the neighborhood of Jerusalem, memorable as the scene of the last sufferings of our Lord. The traditionary site of this garden places it on the e. side of the city, a very little beyond the Kedron, near the base of Mt. Olivet. It contains some very old olive trees, piously regarded as having stood there in the time of our Lord.

Gettysburg, Adams co., Pa., 48 mi. s.w. of Harrisburg. Railroads: P. & R.; West Md. Here are located Pennsylvania College and the Lutheran Theological Seminary. Iron ore and granite are found in the vicinity; it is also an agricultural district. The Katalysine spring, a summer resort, is in the vicinity. Here are the National Cemetery for Union soldiers, and a National Homestead for the orphans of Union soldiers. Here on July 1–3, 1863, was fought the most important battle of the Civil War. Pop. 1900, 3,495.

Geysers, a slight alteration of the Icelandic name *geysir*, from *geysa*, to gush or rush forth, and applied to natural springs of hot water of the kind that were first observed in Iceland. The geysers in Iceland, about a hundred in number, lie about 30 mi. n.w. of Mount Hecla, in a plain covered by hot springs and steaming apertures. The two most remarkable are the Great Geyser and the New Geyser, or Strokkur (churn), the former of which throws up at times a column of hot water to the height of from 80 to 200 ft. The basin of the Great Geyser is about 70 feet across at its greatest diameter. The New Geyser, which is only 100 yards distant, is much inferior in size. The springs are supposed to be connected with Mount Hecla, and the phenomenon of eruption has been explained by Tyndall as due to the heating of the walls of a fissure, whereby the water is slowly raised to the boiling point under pressure, and explodes into steam, an interval being required for the process to be repeated. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone Region of Wyoming, the largest of which throw up jets of water from 90 to 250 ft. high. The hot lake district of Auckland, New Zealand, is also famous in possessing some of the most remarkable geyser scenery in the world. These phenomena are of three kinds: the puias (fire springs), geysers continually or intermittently active; *mgawhas*, or inactive *puias*, which emit steam, but do not throw up columns of water; and *waiariki*, or hot water cisterns. This region was remarkable for the number of natural terraces containing hot-water pools or cisterns, and its lakes all filled at intervals by the boiling geysers and thermal springs, but the configuration of the country was considerably altered by the disastrous volcanic outbreak of 1886. Ngahapu, or Ohopia, a circular rocky basin, 40 ft. in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 ft., emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere.

Ghara (or Garra), a river in the Punjab, being the name by which the united streams of the Bias and Sutlej are known, from their confluence at Endrisa to the junction with the Chenab, after which the united waters flow under the name of the Punjnad to the Indus. The Ghara is about 300 mi. long.

Ghats (or Ghauts), EASTERN and WESTERN, two ranges of mountains in the peninsular portion of Hindustan. The general elevation of the Western Ghâts varies from 4,000 to 7,000 ft. The Western Ghâts form a watershed, and the rain collected on its eastern slopes makes it way right across India to the Bay of Bengal.

Ghazipur, a town in Hindustan, headquarters of the Ghazipur District, Northwestern Provinces, about 44 mi. n.e. of the town of Benares. It stretches along the banks of the Ganges; has a trade in sugar, tobacco, rose-water, and otto of roses, and is a healthy place. The ruins of the Palace of the Forty Pillars, and a monument to Lord Cornwallis, who died here in 1805, are here. Pop. 32,885. The district, one of the hottest and dampest in the n.w., has an area of 1,473 sq. mi., and a pop. of 1,014,099 persons.

Ghee (gē) (or Ghi), a peculiar kind of butter in use among the Hindus. It is made from the milk of the buffalo or the cow. The milk is boiled for an hour or so, and cooled, after which a little curdled milk is added. Next morning the curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half hour, when the butter forms. When, after a few days, it becomes rancid, it is boiled till all the water is expelled, and a little more curdled milk added with some salt or betel leaves, after which it is put into pots. In this state it will keep for a long time. It is a favorite article of consumption among rich Hindus.

Ghent (gent), a town in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Scheldt. It is upward of 6 mi. in circumference, and is divided by canals into a number of islands connected with each other by bridges. Among the notable buildings are the cathedral of St. Bavon, the church of St. Nicholas, the church of St. Michael, the university, a handsome modern structure, with a library of about 100,000 volumes and 700 MSS.; the Hôtel-de-Ville; the Belfry, a lofty square tower surmounted by a gilded dragon, and containing a fine set of chimes consisting of forty-four bells, etc. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Other industries of importance are sugar refining, hosiery, thread, ribbons, instruments in steel, carriages, paper, hats, delft ware, tobacco, etc. Pop. 153,740. It is mentioned as a town in the seventh century. In the ninth century Baldwin, the first count of Flanders, built a fortress here against the Normans. The wealth and liberty of its citizens disposed them to a bold maintenance of their privileges against the encroachments of feudal lords like the dukes of Burgundy and the kings of Spain. Two great revolts took place under the leadership of the Van Arteveldes (1338 and 1369) against Burgundy, and again in the sixteenth century against Charles V. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the department of Escaut (Scheldt). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland.

Ghiberti (gē-ber′tē), Lorenzo (1378–1455), Italian statuary, at Florence. He was engaged in painting frescoes at Rimini, in the palace of Pandolfo Malatesta, when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistery of San Giovanni. The judges selected the works of Donatello and Ghiberti as the best. After twenty-one years' labor Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michael Angelo said of these, that they were worthy of adorning the entrance to paradise. During these forty years Ghiberti also completed other works, bas reliefs, statues, and some excellent paintings on glass, most of which may be seen in the cathedral and the church of Or Sam Michele at Florence.

Ghika, Helena, Princess Koltzoff-Massalsky (1828–1888), better known by the pseudonym of Dora d'Istria, a writer of travels, historical studies, and novels. She was the daughter of Prince Michael Ghika, and niece of Gregory Ghika X, hospodar of Wallachia, and was b. at Bukarest. In 1849 she was married to Prince Koltzoff-Massalsky.

Ghirlandaio (gir-län-dä′yō) (or Corradi Domenico) (1450–1495), one of the older Florentine painters, b. at Florence. He was distinguished by fertility of invention, a more natural rendering of life, and a more accurate perspective than his predecessors. Among his best works are the frescoes in the Sassetti Chapel of the Trinity Church, and in the choir of Santa Maria Novella at Florence, and the pictures in the Uffizi and the academy at Florence.

Giants, people of extraordinary statue. History, both sacred and profane, makes mention of giants, and even of races of giants, but this in general occurs only at an early stage of civilization when the national mind is apt to exaggerate anything unusual. Hence the Cyclopes and Læstrygones of the ancients and the Cornish and Welsh giants of English folklore. The first mention of giants in the Bible is in Gen. 6:4, where the Hebrew word used is *nephilim*, a word which occurs in only one other passage, where it is applied to the sons of Anak, who dwelt about Hebron, and who were described by the terrified spies as of such size that compared with them they appeared in their own sight as grasshoppers. A race of giants called the Rephaim is frequently mentioned in the Bible, and in Genesis 14 and 15 appear as a distinct tribe, of whom Og, king of Bashan, is said to have been the last. Other races of giants are mentioned, such as the Emim, the Zuzim, and the Zamzummim. The giants of old Greek or of Norse mythology have, of course, merely a symbolic existence, representing benignant or adverse forces of nature on which man might count in his struggle to reduce the world around him into some kind of order. The tales of the old writers regarding gigantic human skeletons have now no importance, it being mostly certain that these bones do not belong to giants, but to animals of the primitive world which, from ignorance of anatomy, were taken for human bones. The ordinary height of men is between 5 and 6 ft.; among the Patagonians of South America, however, the average seems to be considerably higher, though not so high as

to entitle them to be considered a race of giants. Notable deviations from this medium height are not at all uncommon, especially among the Teutonic peoples. The following are among authentic instances, ancient and modern, of persons who attained to the stature of giants: The Roman emperor Maximin, a Thracian, nearly 9 ft. in height; Queen Elizabeth's Flemish porter, 7 ft. 6 in.; C. Munster, a yeoman of the guard in Hanover, 8 ft. 6 in. high; Cajanus, a Swedish giant, about 9 ft. high; C. Byrne, who d. in 1783, attained the height of 8 ft. 4 in.; Patrick Cotter O'Brien, who lived about the same time, was 8 ft. 7¾ in.; a Swede in the celebrated grenadier guard of Frederick William I of Prussia stood 8½ ft. The following are still or were quite recently exhibiting: Anna Swan, a native of Nova Scotia, above 8 ft. high; her husband, Captain Bates, a native of Kentucky, of the same height; Chang-wu-gon, the Chinese giant, 7 ft. 9 in. high. As a rule giants are comparatively feeble in body and mind, and are short-lived. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed, but the skull, brain, and forehead are relatively small, the jaws very large, the shoulders, breast, and haunches very broad, and the muscular system comparatively weak.

Gibbon, a name common to the apes of the genus *Hylobătes*, but more particularly restricted to the species *Hylobătes lar*, which inhabits the islands of the Indian Archipelago.

The Active Gibbon.

It is distinguished from other quadrumanous animals by the slenderness of its form, but more particularly by the extraordinary length of its arms, which, when the animal is standing, reach nearly to the ankles, and which enable it to swing itself from tree to tree with wonderful agility. Its color is black, its face surrounded with a white or gray beard.

Gibbon, Edward (1737–1794), an eminent English historian, was b. at Putney in Surrey. He entered Magdalen College, Oxford, where he remained fourteen months. Having declared himself a Roman Catholic, his father placed him under the care of M. Pavillard, a learned Calvinistic minister at Lausanne, by whom he was reconverted to the Protestant faith. The belles-lettres and the history of the human mind chiefly occupied his attention. In 1758 he returned to England, and immediately began to lay the foundation of a copious library; and soon after composed in the French language his *Essai sur l'Etude de la Littérature* (1761). In 1763 he visited Paris and Lausanne, and journeyed in Italy during 1764. It was here that the idea of writing his great history occurred to him as he sat musing among the ruins of the capitol at Rome, while the barefooted friars were singing vespers in the Temple of Jupiter. In 1774 he obtained a seat in Parliament for Liskeard, and was a silent supporter of the North administration and its American politics for eight years. In 1776 the first quarto volume of his *Decline and Fall of the Roman Empire* was published, and at once made a public reputation for its author. In 1793 he returned to England, where he died.

Gibbon, James, cardinal, archbishop of Baltimore, one of the broadest and ablest of living churchmen, was b. in Baltimore, July 23, 1834. Ordained July, 1861. Consecrated bishop and vicar apostolic of N. C., 1868: bishop of Richmond, 1872; archbishop of Baltimore, 1877; created cardinal, 1886. As an author he is best known by *The Faith of Our Fathers*.

Gibbon, John, Gen., b. in Pennsylvania, 1826. Distinguished for service during the Civil War. Promoted brigadier general in 1886. Placed on retired list, 1891.

Gibeon, one of the ancient royal cities of the Canaanites, a "great city" of the Hivites, who at an early stage of Joshua's conquests, by disguising themselves in old clothes and professing to come from a far country, obtained an alliance and covenant with the Israelites. Gibeon has been identified with the modern El-Jib.

Gibraltar (jib-ral′tar), a town and strongly fortified rocky peninsula near the southern extremity of Spain, belonging to Great Britain. It is connected with the mainland by a low sandy isthmus, 1½ mi. long and ¾ mi. broad, known as the "neutral ground," and has Gibraltar Bay on the west, the open sea on the east and south. The highest point of the rock is about 1,400 ft. above sea-level; its north face is almost perpendicular, while its side exhibits tremendous precipices. On its south side it is almost inaccessible, making approach from seaward impossible; the west side, again, although very rugged and precipitous, slopes toward the sea; and here the rock is secured by extensive and powerful batteries, rendering it apparently impregnable. Numerous caverns and galleries, extending 2 to 3 mi. in length, and of sufficient width for carriages, have been cut in the solid rock, with portholes at

intervals of every 12 yds. bearing upon the neutral ground and the bay, and mounted with more than 1,000 guns, some of them of the largest size. The garrison numbers about 5,000. The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus fronts the bay. It consists chiefly of one spacious street about ½ mi. in length. The principal buildings are the governer's and lieutenant governor's houses, the admiralty, naval hospital, victualing office, and barracks, and a handsome theater. Gibraltar is a free port, and has a considerable shipping trade, being an entrepôt for the distribution of British manufactures. The chief export is wine. The administration is vested in the governor, who is also commander in chief of the troops. The civil population amounts to about 18,000. Gibraltar, known to the Greeks as Calpe, was first fortified as a strategic point by the Saracen leader Tarik Ibn Zeiad in 711–12, from whom it was thenceforward called Gebel-al-Tarik, the rock of Tarik. It was ultimately taken by the Spaniards from the Moors in 1462, fortified in the European style, and so much strengthened that the engineers of the seventeenth century considered it impregnable. It was taken, however, after a vigorous bombardment in 1704 by a combined English and Dutch force, and secured to Britain by the Peace of Utrecht in 1713.

Gibraltar, Straits of, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and 15 mi. across. A strong and constant current flows into the Mediterranean from the Atlantic Ocean, in the middle of the straits, but the under current as well as two feeble lateral currents along the coast set toward the ocean.

Gibson, John (1790–1866), one of the most distinguished English sculptors of modern times, b. near Conway, in Wales. He attracted attention by a figure of *Time* modeled in wax, which he exhibited at the age of eighteen. The patronage of Mr. W. Roscoe assisted him to go to Rome, where he was cordially received by Canova. On the death of Canova in 1822 Gibson entered the studio of Thorwaldsen. In 1836 he was made Royal Academician. Most of Gibson's subjects are taken from classical mythology, and are executed with a noble severity and purity of style. Among his best works are: *The Wounded Amazon; The Hunter and His Dog; Hylas and the Nymphs; Helen; Proserpine; Sappho;* etc.

Gideon, the son of Joash, of the tribe of Manasseh, divinely called to deliver the Israelites from the oppression of the Midianites. Having effected their deliverance, he was chosen judge of Israel.

Giers (gērz), Nicholas Carlovitch de, a Russian statesman descended from a Swedish family settled in Finland, was b. in 1820. After holding various posts, in 1875 he became adjunct to Prince Gortschakoff, the minister of foreign affairs, whom he succeeded in 1882.

Gifford, William (1757–1826), a critic and satirist, b. at Ashburton, in Devonshire. After being some time tutor in Earl Grosvenor's family he published in 1794, *The Bæviad*, a satire directed against the poetasters of the Della Crusca school; and in 1795, *The Mæviad*, a severe satire on the contemporary drama. In 1797 he became editor of the *Anti-Jacobin;* and he published a translation of *Juvenal* in 1802. On the foundation of the *Quarterly Review* in 1809 he became its editor. He also edited the works of Massinger, Ford, Jonson, and Shirley. He was interred in Westminster Abbey.

Gijon (*hē-hōn*), a seaport in Spain, on the Bay of Biscay. It consists of an old and a new town, the former on the upper part of a slope and the latter below. It contains a cigar manufactory, and has various other industries and a good trade. Pop. 30,591.

Gila (jē′lå), Rio, a North American river. which rises in New Mexico and flows westward for 450 mi. and then unites with the Colorado. Curious ruins of stone-built houses occur all along its banks. In these are found fragments of pottery.

Gila Monster is a name commonly given to the poisonous lizard *Heloderma suspectum*, also called Sonoran Heloderm. It is one of the largest lizards of North America, and is found in the sandy deserts of New Mexico, Arizona, and Texas. Its scales are brilliant orange and

Gila Monster.

jet black. Its poisonous qualities it shares with its congener the *Heloderma horridum* of Mexico, which, like snakes, has grooved teeth and highly developed salivary glands at their bases. Its bite is rapidly fatal to small mammals and birds, and very injurious, though seldom fatal to man. The heloderms are the only lizards ascertained to be venomous.

Gilbert, Sir John, R. A., English painter, b. in 1817. His first notable work was *The Arrest of Lord Hastings by the Protector Richard, duke of Gloucester*, in water color. He has also painted in oil; and among his more notable productions in that branch of the art are *Don Quixote Giving Advice to Sancho Panza*, *The Education of Gil Blas*, and a series of tableaux of the principal characters in Shakes-

peare. In 1871 he became president of the Society of Water Colors. Died 1897.

Gilbert, WILLIAM SCHWENK, English dramatist, b. in London in 1836. In 1857 he became a clerk in the Education Office; in 1862 he was called to the bar, but he has since devoted his time almost exclusively to literature. In 1875 he entered into partnership with Arthur Sullivan, the composer, and in conjunction with him produced a series of comic operas.

Gilbert Islands (or Kingsmill Group), a group of sixteen islands in the Pacific Ocean, on the Equator. They are of coral formation, and all low and not fertile. Their chief products are the cocoanut, pandanus, taro, and the bread-fruit tree. Pop. of the group 60,000.

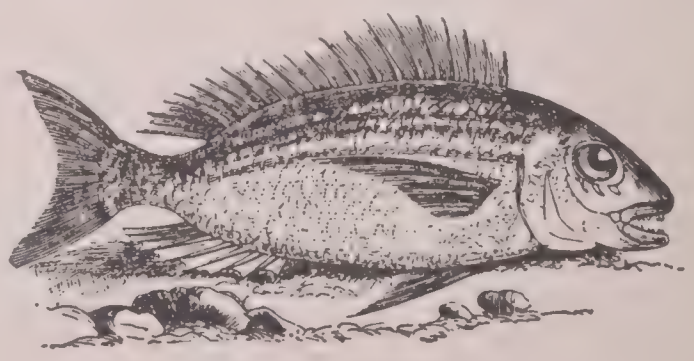
Gilding is the art of applying gold leaf or gold in a finely-divided state to surfaces of wood, stone, or metals, a very ancient art, being practised among the Egyptians, Greeks, Romans, and ancient Persians. The processes employed at the present day are very varied. Metals are gilded either by what is called chemical gilding, mercurial gilding, by electro gilding, or by the application of gold leaf. Copper and brass, for instance, may be gilded by the process called *wash* or *water gilding*, with an amalgam of gold and mercury. The surface of the copper, freed from oxide, is covered with the amalgam, and afterward exposed to heat till the mercury is driven off, leaving a thin coat of gold. Gilding is also performed by dipping a linen rag in a saturated solution of gold, and burning it to tinder, the black powder thus obtained being rubbed on the metal to be gilded, with a cork dipped in salt water, till the gilding appears. Iron or steel is often gilded by applying gold leaf, after the surface has been well cleaned, and heated until it has acquired the blue color which at a certain temperature it assumes. Several leaves of gold are thus applied in succession, and the last is burnished down cold. One process of chemical gilding is by dipping the article into a solution of gold, which is termed Elkington's solution, being composed as follows: 5 oz. (troy) of fine gold; nitro-muriatic acid, 52 oz. (avoirdupois); dissolve by heat, and continue the heat until the cessation of red or yellow vapors; decant the clear liquid; add 4 gal. of distilled water, pure bicarbonate of potassa, 20 lbs., and boil for two hours. Gilding on wood, plaster, leather, parchment, or paper, is performed by different processes of mechanical gilding. The first of these is oil gilding, in which gold leaf is cemented to the work by means of oil-size. In the case of paper or vellum the parts to be gilt receive a coat of gum water or fine size, and the gold leaf is applied before the parts are dry. They are afterward burnished with agate. Lettering and other gilding on bound books are applied without size. The gold leaf is laid on the leather and imprinted with hot, brass types. Brass rollers with thin edges are employed in the same way for lines, and similar tools for other ornaments. When the edges of the leaves of books are to be gilt

they are first cut smooth in the press, after which a solution of isinglass in spirits is laid on, and the gold leaf is applied when the edges are in a proper state of dryness. Japanner's gilding is another kind of mechanical gilding, which is performed in the same way as oil gilding, except that instead of gold leaf a gold dust or powder is employed. Frames of pictures and mirrors, moldings, etc., are gilt by the application of gold leaf, or by the cheaper process of "German gilding," that is, by tin foil or silver leaf, with a yellow varnish above. Porcelain and other kinds of earthenware, as well as glass, may be gilt by fixing a layer of gold in a powdered state by the action of fire. The gold dust or powder required in this operation may be obtained by precipitating it from a solution in aqua regia, either by means of sulphate of iron or proto-nitrate of mercury. In order that the gold powder may be applied to the surface of the article to be gilt, it must be well mixed with some viscous vehicle, such as strongly-gummed water. It is then laid on with a fine camel's-hair brush.

Gills, the respiratory organs of animals which respire by obtaining oxygen from water, as crustaceans, molluscs, fishes, and amphibians. In fishes they consist of cartilaginous or bony arches attached to the bones of the head, and furnished on the exterior convex side with a multitude of fleshy leaves or fringed vascular fibrils resembling plumes, and of a red color in a healthy state. The water is admitted by the gill-opening, and acts upon the blood as it circulates in the fibrils.

Gilo'lo (Jilolo), an island in the Indian Archipelago, the largest of the Moluccas; area 6,500 sq. mi. It is of singular form, consisting of four peninsulas, radiating n., n.e., e.s.e., and s., from a common center, and having large bays between. The principal productions are sago, cocoanuts, spices, fruits, edible birds'-nests, useful timber, etc.; horses, cattle, and sheep abound. Deer, wild boars, and other game are likewise plentiful. The greater part of Gilolo is under the sultan of Ternate; pop. 23,000; the other is nominally under the sultan of Tidor; pop. about 4,500.

Gilthead, an acanthopterygious fish of the Sparidæ or seabream family, common in the Mediterranean. It has strong grinding teeth



Common Gilthead.

for crushing the shells of the molluscs, on which it feeds; a yellow band stretches from eye to eye. Its color is a mixture of silver and sky-blue, its dorsal and caudal fins are black, while brown lines pass along the sides. It is a

fine fish, and sometimes reaches a weight of 18 to 20 lbs.

Gin, a spirit distilled from grain, and flavored with juniper berries, and sometimes with oil of turpentine and common salt, and other substances. It is largely manufactured in Holland, particularly in Schiedam, and the gin thence imported is thus often called Schiedam as well as Holland.

Gin, the name of certain machines employed in raising weights. One form consists of three poles, 12 to 15 ft. long, often tapering from the lower extremity to the top and united at their upper extremities, whence a block and tackle is suspended. A space of 8 or 9 ft. separates the lower extremities planted in the ground, and a kind of windlass is attached to two of the legs. Another kind of gin is a sort of whim or windlass for raising coal, etc. It is worked by a horse, which turns a cylinder, and winds on it a rope, by which the weight is raised.

Ginger, an East Indian plant of the order Zingiberaceæ. It grows in moist places in various parts of tropical Asia and the Asiatic islands, and has been introduced into the West Indies, particularly Jamaica, as also into South America and West Africa. The kind most esteemed is Jamaica ginger. The rhizome, or underground stem, is what is used, being employed in various ways. It has an aromatic, pungent taste, and when young is candied and makes an excellent preserve. It is a favorite condiment, and is used medicinally as a carminative, and in debility of the stomach and alimentary canal. It enters into the composition of a great number of confections, infusions, pills, etc. The special preparations are the *tincture* and the *essence* of ginger; *syrup* prepared by mixing twenty-five parts of syrup with one of strong tincture.

Common Ginger. *a.*—plant with barren and flowering stems; *b.*—flower; *c.*—portion of leafy stem.

Gingham (ging'am), a cotton fabric, distinguished from calico by having the colors woven with the fabric, not printed on it. The patterns are various; sometimes fancy designs, sometimes checkered, and sometimes striped. Umbrella ginghams are all of one color.

Ginsburg (gins'bu*r*h), Christian D., rabbinical scholar, b. at Warsaw in 1830. He is the author of *Historical and Critical Commentary on the Song of Songs; The Karaites, their History and Literature; The Essenes; The Kabbalah, its Doctrines, Development, and Literature;* and other works of similar character. His greatest work is the *Massora.*

Ginseng (jin'seng), a plant of Northern Asia, *Panax schinseng,* herbaceous, and about 1 ft. high. Its root is regarded as a sort of panacea among the Chinese, and is largely imported, but it appears to be really of very little efficacy; the taste is sweet and mucilaginous, accompanied with some bitterness, and also slightly aromatic. Another species of ginseng, *Panax quinquefolium,* inhabits Canada and the northeastern parts of the U. S. Quantities of its root are sent to China, where it sells for $2 to $4 a pound. There is a ginseng farm in Onondaga co., N. Y.

Gioberti (jō-ber'tē), Vincenzo (1801–1852), an Italian philosopher and statesman, b. at Turin. Having been educated for the church, he was appointed chaplain to Charles Albert, king of Sardinia, but having rendered himself obnoxious by his republican sentiments, he was first imprisoned, and in 1833 banished. He became a teacher of philosophy in a school at Brussels. In 1843 appeared his *Primato Morale e Civile degli Italiani,* a defense of liberal principles of the Papacy, a work which brought over the majority of the priests to the national party. When Charles Albert in 1848 granted a constitution to Sardinia, Gioberti returned to his native country, but he soon after withdrew to Paris.

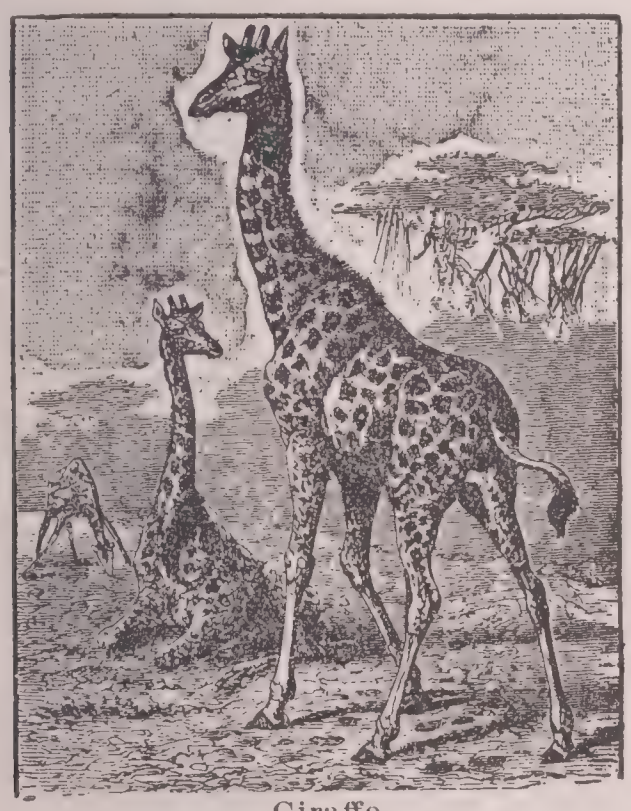
Giordano (jor-dä'nō), Luca (1632–1705), Italian painter, b. at Naples. In 1679 he was employed by Charles II to ornament the Escurial, and at the court of Spain he became a great favorite. Giordano was especially successful in imitating the manner of Bassano, and of the Chevalier Massimo Stanzioni. After the death of Charles II he returned to his native country, where he d. His most celebrated pieces are his frescoes in the Escurial, at Madrid, Florence, and Rome. Some of his finest paintings are at Dresden.

Giorgione (jor-jo'nā) (properly Giorgio Barbarelli) (1477–1511), at Castelfranco, one of the most celebrated painters of the Venetian school. In Venice he ornamented the façades of several large buildings with frescoes, which have mostly perished. His portraits are reckoned among the finest of the Italian school. His pieces are rare, but some are to be seen at Milan, and in the galleries at Vienna and Dresden.

Giotto (jot'tō) (properly Ambrogiotto or Angiolotto Bondone) (1276–1336), a celebrated Italian painter. He was b. at the Florentine village of Vespignano. His natural talent and gracefulness developed so rapidly that he soon surpassed all his contemporaries. His figures

have more life and freedom than those of Cimabue, as he particularly avoided the stiff style. Among his most celebrated pieces is the *Navicella* (ship), at Rome (a picture of Peter walking upon the waves), some fresco paintings at Florence, also the history of St. Francis, at Assisi, and several miniatures. He was equally successful as a statuary and architect.

Giraffe (ji-raf′), a ruminant animal inhabiting Africa, and constituting the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 ft. This great stature is mainly due to the extraordinary length of the neck, in which, however, there are but seven vertebræ, though these are extremely elongated. It has two bony excrescences on its head resembling horns. Its great height is admira-



Giraffe.

bly suited with its habit of feeding on the leaves of trees, and in this the animal is further aided by its tongue, which is both prehensile and capable of being remarkably elongated or contracted at will. When it browses the herbage on the ground it stretches out its fore legs as wide as possible till it can reach the ground by means of its long neck. Its color is usually light fawn, marked with darker spots. It is a mild and inoffensive animal, and in captivity is very gentle and playful. The giraffe is a native of a great part of Africa, from Abyssinia and Sennaar to Senegal and the regions adjacent to the Cape Colony.

Giral′dus Cambren′sis, an early English historian, b. about 1146. His proper name was Gerald de Barry. As companion to the king's son, Prince John, he went to Ireland in 1185, where he collected the materials for his *Topography of Ireland.* He afterward drew up a similar work on Wales.

Girard, Stephen (1750–1831), philanthropist and banker, b. at Bordeaux, France. He began his business career when but thirteen years old as a sailor. In 1773 he was already master

and captain of a vessel engaged in the West Indies and American coast trade, operating between New York, New Orleans, and Port au Prince. In 1777 he began his mercantile career in Philadelphia. From 1780 to 1790 he was in the West India trade, in partnership with his brother John. When the yellow fever broke out in Philadelphia, he devoted himself to the care of the sick and the burial of the dead. He interested himself in municipal affairs, and materially aided the cause of charity. He was made warden of the port and director of many public institutions. He instituted the Girard bank, and during the War of 1812, placed its resources at the disposal of the government. At his death his immense fortune was left to charitable and municipal institutions of Philadelphia and New Orleans. He provided in his will for the establishment of Girard College, a school for white male orphans between the ages of four and eighteen. It was required that every beneficiary of this institution be given an industrial education. His will provided for moral and religious training without the aid of ecclesiastics. He especially enjoined that the orphans be instructed in the purest morality; that a love for truth, sobriety, and industry be carefully inculcated; and that benevolence toward their fellow men be encouraged. They were in no way to be biased in their religious beliefs, but to be left free to choose as their natural judgment should dictate. It is said that the value of the residuary fund of Girard College is about $12,358,148.

Girardin (zhē-rär-dan), Emile de (1802–1881), French journalist and politician, b. in Switzerland, and educated in Paris. He was connected as projector, editor, or otherwise with a number of newspapers and periodicals, the most successful being *La Presse,* a Conservative organ established in 1836. A controversy in its columns led to a duel between Girardin and Armand Carrel, which proved fatal to the latter. He wrote numerous political pamphlets, and a few pieces for the stage.

Girasol (ji′ra-sōl), a precious opaline stone, which, under strong lights, reflects a brilliant reddish light. It is usually of a milk-white or bluish-white color. The brightest are brought from Brazil and Siberia. The name is sometimes bestowed on the Asteria sapphire. One variety is known as the fire opal.

Girder, a main beam either of wood or iron, resting upon a wall or pier at each end, employed for supporting a superstructure, or a superincumbent weight, as a floor, the upper wall of a house when the lower part is sustained by pillars, the roadway of a bridge, and the like. Wooden girders are sometimes cut in two longitudinally and an iron plate inserted between the pieces, and the whole bolted together. This species of girder is called a *sandwich girder.* For bridges cast iron girders are sometimes cast in lengths of 40 ft. and upward, but when the span to be crossed is much greater than 40 ft., recourse is had to wrought iron, or to *trussed, lattice,* or *box girders,* and cast iron is now little used. A *trussed girder* is a wooden girder strengthened with

iron. A *lattice girder* is a girder consisting of two horizontal beams united by diagonal crossing bars, somewhat resembling wooden lattice work. A *box girder* is a kind of girder resembling a large box, such as those employed in tubular bridges. There are also *bowstring girders*, which are varieties of the lattice girder, and consist of an arched beam, a horizontal tie resisting tension and holding together the ends of the arched rib, a series of vertical suspending bars by which the platform is hung from the arched rib, and a series of diagonal braces between the suspending bars.

Girondists (*Girondins*), one of the great political parties of the first French revolution. The Girondists were republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their leaders were three of the deputies of the Gironde —Vergniaud, Guadet, and Gensonné, hence the name.

Giulio Romano (jö′lē-ō rō-mä′nō) (or Giulio Pippi), Italian painter, architect, and engineer, the most distinguished of Raphael's scholars, b. at Rome near the end of the fifteenth century. After the death of Raphael he gave himself up to his own imagination, and astonished all by the boldness of his style, by the grandeur of his designs, by the fire of his composition, by the loftiness of his poetical ideas, and his power of expression.

Glacial Period (or Ice Age), in geology, denotes that portion of the post-tertiary period, in which all parts of the Old and the New World north of latitude 50°–40° were subjected to intense cold, and covered with ice and glaciers, This phenomenon has been demonstrated from a study of the actual effects of glaciers in the Alps, etc. The traces of ancient glacial action are abundantly discoverable in the Highlands of Scotland, in England, in the Scandinavian range, the Jura, the Black Forest, etc. In Asia they are perceptible in the Himalaya, while North America abounds with them.

Glaciers, icy masses of great bulk, harder than snow, yet not exactly like common ice, which cover the summits and sides of mountains above the snow line. They are found in Switzerland, Scandinavia, the Andes, etc. They extend down into the valleys often far below the snow line, and bear a considerable resemblance to a frozen torrent. They take their origin in the higher valleys, where they are formed by the congelation and compression of masses of snow in that condition called by French writers *névé*, by German authors *firn*. The ice of glaciers differs from that produced by the freezing of still water, and is composed of thin layers filled with air bubbles. It is likewise more brittle and less transparent. The glaciers are continully moving downward, and not unfrequently reach the borders of cultivation. The rate at which a glacier moves generally varies from 18 to 24 in. in 24 hours. At its lower end it is generally very steep and inaccessible. In its middle course it resembles a frozen stream with an undulating surface, broken up by fissures or *crevasses*. As it descends it experiences a gradual diminution from the action of the sun and rain, and from the heat of the earth. Hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from their lower extremity. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. A

The edge of the Muir Glacier, Alaska.

remarkable glacier phenomenon is that of *moraines*, as they are called, consisting of accumulations of stones and detritus piled up on the sides of the glacier, or scattered along the surface. They are composed of fragments of rock detached by the action of frost and other causes. The fissures or crevasses by which glaciers are traversed are sometimes more than 100 ft. in depth, and from being often covered with snow are exceedingly dangerous to travelers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5,700 ft. above the level of the sea. It is more especially, however, in the chain of Monte Rosa that the phenomena of glaciers are exhibited in their greatest sublimity, as also in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snow-line. Those of Norway are well known, and they abound in Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalaya. They are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The problem of the descent of glaciers is of extraordinary interest, and various theories

have been put forward to account for it. It was shown by Prof. J. D. Forbes, of Edinburgh, that a glacier moves very much like a river; the middle and upper parts faster than the sides and the bottom; and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the *viscous theory* of glaciers, which presupposes that ice is a plastic body; and this plasticity has been satisfactorily explained by Prof. James Thomson of Glasgow by the phenomenon of the melting and refreezing of ice. Water, he discovered, when subjected to pressure, freezes at a lower temperature than when the pressure is removed. Consequently when ice is subjected to pressure it melts; if it is relieved of pressure the water again solidifies. Therefore if two pieces of ice are pressed together, they tend to relieve themselves by melting at their points of contact, and the water thus produced immediately solidifies on its escape. If ice is strained in any way it similarly relieves itself at the strained parts, and a similar regelation follows. This, when applied to the glaciers, gives a complete explanation of their plasticity. Pressed downward by the vast superincumbent mass, the ice gradually yields. Melting and refreezing take place at some parts, at others the gradual yielding at strained points goes on. In the latter process there is no visible melting, but there is the gradual yielding from point to point to the pressure above, and there is the transferrence relatively to each other of the molecules that constitute the, at first sight, solid mass. If, however, at certain points the strain is intense, the ice becomes extremely brittle. The latter fact disposes of Tyndall's objection to Forbes's theory, which was based on the fact that *crevasses* proved the brittleness, and not the vicosity of ice.

Glacier Tables, large stones found on glaciers supported on pedestals of ice. The stones attain this peculiar position by the melting away of the ice around them, and the depression of its general surface by the action of the sun and rain. The block, like an umbrella, protects the ice below it from both; and accordingly its elevation measures the level of the glacier at a former period. By and by the stone table becomes too heavy for the column of ice on which it rests, or its equilibrium becomes unstable, whereupon it topples over, and falling on the surface of the glacier defends a new space of ice, and begins to mount afresh.

Gladden, Washington, b. 1836, in Pennsylvania. He was educated at Williams College, and became a Congregational minister in 1860. He received the degree of LL.D at the University of Wisconsin in 1881. Among the books which he has published are, *Amusements—their Uses and Abuses; From the Hub to the Hudson; The Lord's Prayer; Applied Christianity; Who Wrote the Bible*, etc.

Gladia'tors, combatants who fought at the public games in Rome for the entertainment of the spectators. The first instance known

of gladiators being exhibited was in B. C. 264, by Marcus and Decimus Brutus at the funeral of their father. They were at first prisoners, slaves, or condemned criminals; but afterward freemen fought in the arena, either for hire or from choice; and latterly men of senatorial rank, and even women, fought. The regular gladiators were instructed in schools, and the overseer purchased the gladiators and maintained them. Men of position sometimes kept gladiatorial schools and lanistæ of their own. The gladiators fought in the schools with wooden swords. In the public exhibitions, if a vanquished gladiator was not killed in the combat, his fate was decided by the people. If they wished his death, perhaps because he had not shown sufficient skill or bravery, they held up their thumbs; the opposite motion was the signal to save him. The victor received a branch of palm or a garland. The gladiators were classified according to their arms and mode of fighting; thus there were *retiarii* who carried a trident and a net in which they tried to entangle their opponent; *Thracians*, who were armed with the round Thracian buckler and a short sword; *secutores*, who were pitted against the *retiarii;* etc.

Gladi'olus, a genus of plants of the Iris order, having a bulbous root with a reticulated covering, natives of Europe and North Africa, but especially South Africa. The leaves are ensiform, the flowers brilliantly colored. There are many species, some of them popular garden plants, others grown in hot-houses.

Gladiolus.

Gladstone, William Ewart, celebrated living statesman, son of Sir John Gladstone, born at Liverpool, 1809. He entered Eton 1821, and left it in 1827. He became a student of Christ Church, Oxford, in 1829, and left college in 1831. In 1832 the first Reform Act was passed, and Gladstone's public career commenced by his being returned for Newark, and when Peel assumed office in 1834 he accepted the post of junior lord of the treasury. In 1841 he became, under Peel, vice-president of the Board of Trade and master of the mint. Having become president of the Board of Trade, he carried, in 1843, a measure for the abolition of restrictions on the exportation of machinery, and in 1844 he carried a railway bill, establishing cheap trains. He took part with Peel in the repeal of the corn-laws, a course which cost him his seat for Newark. In 1847 he was returned for Oxford University. He now began to develop remarkable ability as a financier, and fiercely attacked Disraeli's Budget of 1852. The same year he became

Chancellor of the Exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1858 he became high commissioner extraordinary to the Ionian Islands, and his *Studies on Homer* appeared about the same time. In 1859 he again took office as chancellor of the exchequer under Lord Palmerston. At the general election of 1865 he was returned for South Lancashire, and on the decease of Lord Palmerston became the Liberal leader in the Commons in the Russell Administration, still continuing to hold the chancellorship of the exchequer. In 1867 a Reform bill, establishing household suffrage in burghs, was carried by the Conservatives, but to the final shape of it Gladstone and Bright materially contributed. In 1868 Gladstone succeeded in abolishing compulsory church rates, and carried his resolutions dealing with the Irish Church. At the general election of 1868 he lost his seat for South Lancashire, but was returned by Greenwich. There being a great Liberal majority in the new Parliament Gladstone became premier. Next year he carried his bill for the disestablishment of the Irish Church, and in 1870 his Irish Land act. The Ballot act was passed in 1872, the *Alabama* claims were settled, and the Scottish Education act enrolled on the statute-book. Parliament was dissolved in 1874, and the Conservatives ousted Gladstone from office. During Lord Beaconsfield's tenure of office Gladstone denounced the Bulgarian atrocities; the Anglo-Turkish treaty, the Afghan War, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated him firmly into power. In 1882 a Prevention of Crimes and an Arrears act for Ireland were passed, and in 1883 measures relating to bankruptcy, etc., were carried. In 1884 the bill extending household suffrage to the counties was carried, and the Gladstone ministry fell the next year. Lord Salisbury, who had formed an administration, got the Redistribution of the Seats bill passed, and under it took place the general election of 1885, Gladstone still continuing to represent Midlothian. Next year Lord Salisbury resigned after an adverse vote in the Commons, and Gladstone again came into power. He soon startled the country by introducing a measure of Home Rule for Ireland (April 8, 1886). It failed to pass the Commons, and an appeal was made to the country, the result of which was emphatically adverse to Mr. Gladstone's proposals. He had to make way for Lord Salisbury. In 1892, however, the result was again reversed and Gladstone once more resumed authority. He introduced another Home Rule bill, which was passed by the House of Commons but rejected by the House of Lords. After this Mr. Gladstone retired from public life. He has written several books, among which are, *The State in Its Relation with The Church; Studies on Homer and the Homeric Age; Financial Statements; The Impregnable Rock of Holy Scriptures;* etc. D. May 19, 1898.

Glagolitic Alphabet, an ancient Slavonic alphabet. The Slavonic languages have from very ancient times been written with two alphabets, the glagolitic and cyrillic. The latter is the modern Slavonic and Russian alphabet; the former is still used in Istria, Croatia, and Dalmatia, and its use has been authorized in the Roman Catholic liturgies of those districts. It has been found in two different forms, the fuller of which has forty signs.

Glands, a certain class of structures in animals, some of them forming organs which are the seat of an excretion, and provided with an excretory canal. In man there are two lachrymal glands situated at the external angle of the eyes under the upper eyelid; six salivary, of which three are on each side, behind and under the lower jaw; two parotid, two submaxillary, two sublingual, two mammary, confined to the female (the breasts in women); the liver, the pancreas, the two kidneys, etc. The lymphatic glands, which take up and elaborate the lymph, are somewhat different from these in character; and still more different are certain other bodies so denominated, as the spleen, thymus, pineal, etc. Botanists have given the name of glands to small bodies observed upon the surfaces of plants, and many of which seem to secrete certain fluids.

Glas'gow, the largest city in Scotland, and probably the second largest in Britain, is situated mainly in the county of Lanark, on both banks of the Clyde. The southern portion is built on low-lying, level ground, the northern portion to a great extent on a series of elevations of varying heights. The streets are in general wide and straight. The houses are built almost wholly of freestone, and as a whole Glasgow is now excelled by few cities in the kingdom in architectural beauty and amenity of appearance. Of the buildings the Cathedral, situated in the northeast of the city, is the most noteworthy. It is supposed to have been begun about 1240, and completed within the next two centuries. It is a large Gothic edifice in the early Pointed style, with tower and spire from the center; length of interior 319 ft.; width 63 ft; height of nave 90 ft., of choir 85 ft., spire 225 ft. The new university buildings, in the west end of the city, cover about 4 acres of ground on a splendid site. Connected with the university is the Hunterian Museum of anatomy, natural history, etc. The Municipal Buildings, in the center of the city, in George Square, form an imposing pile in the Renaissance style. They were completed in 1887. A new infirmary, the Western, has been built near the new university. The old infirmary is near the cathedral. Other noteworthy buildings are the Free Church College, the Royal Exchange, the Stock Exchange, the Post Office, the St. Enoch Station and Central Station hotels, several club-houses, banks, and insurance offices. Most of the public monuments are collected in George Square, the finest square in the city. Glasgow has several public parks, the largest, the Green, containing 140 acres. The principal libraries are the University Library,

the Mitchell Free Library, the libraries of the Faculty of Medicine and of the Faculty of Procurators, and the combined Glasgow and Stirling Libraries. There are five theaters. The principal cemetery is the Necropolis. Among educational institutions after the university are Anderson's College Medical School, St. Mungo's College, the Glasgow and West of Scotland Technical College, the Free Church College, Queen Margaret College for women, etc. The industries embrace cotton, linen, silk, woolen, and jute, in all the processes of manufacture; calico printing, dyeing, and bleaching; pig and malleable iron and steel, and machinery and metal goods of all descriptions; shipbuilding, which might almost be called a staple, over 400,000 tons of shipping having been launched in some years on the Clyde; extensive chemical works, potteries, glass works, brick works, breweries, distilleries, tanneries, tobacco works, sugar-refining works, etc. The commerce is commensurate in extent with the manufactures. The origin of the city may be traced back to the foundation of the bishopric by St. Mungo about 560. It was erected into a royal burgh in 1180. The first bridge was built in 1345. In 1546 the shipping of Glasgow is mentioned in an order of the privy council. Latterly commerce began to take other directions, and the progress made within the present century has been very remarkable. Previous to 1832 Glasgow joined Rutherglen, Renfrew, and Dumbarton in sending a member to Parliament; it then got two members to itself, another being added in 1868; in 1885 its representatives were increased to seven. Pop., with suburbs, 792,728.

Glasgow University was founded by a bull of Pope Nicholas V (1450–1451), which conferred not only the power of creating masters and doctors, but privileges and immunities identical with those of the University of Bologna. In 1858 it was reconstituted by the Scottish Universities act, the constitution being similar to that of the other Scottish universities. The old university buildings and ground were sold to the Glasgow Union Railway Co. in 1864 for $500,000, a sum which, supplemented by university funds, government grant, public subscriptions and donations, has enabled upward of $3,000,000 to be expended on fine new buildings in the west end of Glasgow. The university comprises four faculties, viz., those of arts, theology, law, and medicine, each of which embraces equipment of chairs and professors, the latter numbering 28 in all, besides several lecturers. The matriculated students usually number about 2,200. Along with the University of Aberdeen Glasgow University returns a member to Parliament. The university library numbers about 110,000 volumes, and is constantly being augmented.

Glass, an artificial substance, hard, brittle, and in its finest qualities quite transparent, formed by the fusion of siliceous matters with an alkali. Of the origin of its manufacture nothing is known, but the ancient Egyptians carried the art to a great perfection, and are known to have practised it as early as 2000 B. C., if not earlier. The Assyrians, the Phœnicians, the Greeks and Etruscans, were all acquainted with the manufacture. The Romans attained peculiar excellence in glass-making, and among them it was applied to a great variety of purposes. Among the most beautiful specimens of their art are the vases adorned with engraved figures in relief; they were sometimes transparent, sometimes of different colors on a dark ground, and very delicately executed. The Portland or Barberini vase is almost the only surviving specimen of this kind. The mode of preparing glass was known long before it was thought of making windows of it. The first mention of this mode of using glass is to be found in Lactantius, in the third century after Christ. St. Jerome also speaks of it being so used (425 A. D.). Benedict Biscop introduced glass windows into Britain in A. D. 674. In church windows it was used from the third century. The Venetians were long celebrated for their glass manufacture, which was established before 700 A. D. Glass is largely made in the U. S., France, Germany, and Belgium. Glass is formed by the fusion of siliceous matter, such as powdered flint or fine sand, together with some alkali, alkaline earth, salt, or metallic oxide. The nature of the glass will depend upon the quality and proportion of the ingredients of which it is formed, and thus an infinite variety of kinds of glass may be made; but in commerce five kinds are usually recognized: 1, bottle or coarse green glass; 2, broad, spread, or sheet window glass; 3, crown glass, or the best window glass; 4, plate glass, or glass of pure soda; 5, flint glass or glass of lead. Colored glass may be mentioned as a sixth kind. The physical properties of glass are of the highest importance. Perhaps the chief of these is its transparency, and next to that its resistance to acids (except hydrofluoric). It preserves its transparency in a considerable heat, and its expansibility is less than that of any other known solid. Its great ductility, when heated, is also a remarkable property. It can, in this state, be drawn into all shapes, and even be spun into the finest threads. It is a bad conductor of heat, and is very brittle. It is usually cut by the diamond.

The works in which glass is made are called *glass houses.* The furnace is constructed of fire brick and has two kinds of openings, one of which is used to reach the big melting pots containing molten glass, and the other, the "glory hole," provides a place where the workman may thrust his half-blown cylinder and soften it with heat. The fuel used, is for the most part crude oil or gas, coal being too smoky to give the best results. Above the fire and just inside the furnace are the melting pots, usually in a circle, with openings from each to the workroom. These melting or monkey pots, as they are called, are very important, and the workmen must know how to construct them so they will not burst when the fierce heat necessary to melt the glass is first applied. Fire clay is mixed with the finely

ground remains of former monkey pots. It is then moistened and placed in a trough, much like the ordinary baker's dough-trough. A workman walks up and down through it, kneading it with his feet until it becomes a perfectly homogeneous mass about the consistency of putty. The pot is then built up very carefully, special care being taken that no air bubbles are left in the clay. When the pot is about 3 ft. high and 4 ft. wide, large enough to hold a ton of metal, it is placed in a warm, dry room and allowed to remain two months or more. When dry, it is removed to the annealing room, where the temperature is gradually raised to that of the furnace. When baked it is bricked into the main furnace with its yawning mouth to the little doorway and its bottom extending into the heat below. The first charge of glass serves to glaze the pot. Open pots are used for melting ordinary window-glass metal, but with flint glass, where greater purity is required, they are arched with fire clay with a hole left in one side.

The pots are placed in the furnace, where they will last about two months, and are then ready for the metal. For ordinary window glass, which is a silicate of lime or potash, about 30 per cent. of limestone, 40 per cent. of sulphate of soda, and 2 per cent of pulverized charcoal are used with every 100 parts of ordinary glass sand. These ingredients are shoveled into the furnace and the heat is raised to a very high temperature. When the mass becomes as fluid as water the fire is allowed to subside a trifle and the metal is ready for use. The gatherers seize a little mask in their teeth so that the heat will not scorch their faces, and with a blow-pipe collect a big lump of the molten glass, which they turn dexterously over and over until it assumes an oval shape. Sometimes the "dip" is taken out and shaped in a mold. When a workman fixes about 25 pounds of glass to his pipe, he whisks the glowing ball out and runs with it to the blower who is usually the largest workman in the shop. The blower, whose skill is something marvelous, takes the pipe and blows a bubble of air into it, and then swings it at full arm's length down a long, narrow pit. The glass stretches out of its own weight, assuming the shape of a pear. This he blows again and again, swinging it back and forth, and when the glass begins to grow cool he softens it by thrusting it into the "glory-hole." When the glass is thick enough and the bright, glowing cylinder has assumed about the size and shape desired, it is placed on a wooden horse. The blower's pipe having been severed from the cylinder by touching it with a cold piece of iron, the workman first cuts off the round lower cap of the cylinder by means of a cold iron, and then splits the cylinder from end to end with a hot iron. It is placed on a flattening stone of fire clay, warmed a little, and then a workman opens it and smooths it off with a block of wood. When sufficiently hard it is put on a truck and wheeled into the annealing room, where the heat is gradually decreased so that the glass may not be made brittle by sudden cooling. It is now ready for the cutters, who separate it into certain fixed sizes for window-glass and in this shape it goes to market.

Glass

Flint glass is used for small articles, such as lamp chimneys, bottles, goblets, and dishes. It is much more brilliant, tough, and beautiful than window glass. It is so named from the fact that formerly the sand from which it was made was derived wholly from ground flints. It is blown, melted, or pressed, and an expert workman can make 400 dozen small bottles in a day. Pressing glass consists in shaping pieces of metal into a mold by means of a lever arm, and it is used only where solid articles of glass are wanted. Glass tubes are made by workmen, who blow bubbles of air into the molten metal which they have attached to their pipes, and then draw the lumps out quickly until they assume the proper shape.

For *plate glass* the metal is melted in large open kettles and then poured upon a smooth iron casting table. A heavy iron roller is passed over the mass and rolls it even. When it cools it looks like "misted" or ground glass and can be used in that state for skylights or floors, but for windows and mirrors it must be ground and polished. The plate is fastened to a revolving table by means of plaster of Paris, and the general roughness is removed by a grinding engine using ordinary sand. It is then treated with emery and finally with rouge. When these operations are completed the glass is about 60 per cent. as thick as when first rolled, and has assumed a clear, glistening appearance.

Imitation Cut Glass.—When a new article is to be produced a sketch is made. Then a complete working drawing upon paper, or a model prepared from plaster of Paris or wood, is made. When the design is finished it goes to the pattern maker who prepares the patterns of wood or plaster of Paris for the iron casting from which the mold is made. The pattern is for the plain, rough iron casting from which the figure will be worked later, none of the design or relief work being cast in the mold. For an ordinary drinking glass, two half cylinders are hollowed out so that when set together they enclose a cylindrical space slightly smaller than the glass to be made. The rough castings are sent to the mold maker, and if the mold is in sections, it is cast with hinges for fastening the sides together. The mold maker first fits the sections together, planing and polishing the surfaces until they are air-tight. The hinges are then bored and pins put through, holding the mold in the proper position. The bottom is fitted so that when the mold closes it will be air-tight. The interior is polished and is ready for the design which is to appear upon the glass. The workman takes the original drawing, and with a chisel cuts the design into the hard polished metal. When the chisel work is done the whole is polished with emery paper. A plug or plunger is next made. This fits inside of the vessel to be made and is used to press the glass into the mold. It must taper considera-

bly so that it may be easily withdrawn. A loose ring fits the top of the mold having a hole fitted exactly to the base of the plunger. This forms the top edge of the vessel. If the article is very large and elaborately figured the mold must have more than two sections.

Colored Glass.—Colored glass is of two kinds —entirely colored, the coloring matter being melted along with the other ingredients; or partially colored, a quantity of white glass being gathered from one pot, and dipped into the other containing the colored glass, by which the whole receives a skin of colored glass. The coloring matters are chiefly the metallic oxides. A beautiful yellow color is imparted by silver in union with alumina (powdered clay and chloride of silver being used), also by uranium and by glass of antimony; red colors by oxide of iron, copper, and gold: green by protoxide of iron, oxide of copper, oxide of chromium, etc.; blue by cobalt; orange by peroxide of iron with chloride of silver. Bohemia is particularly famous for its manufactures of articles in colored glass.

Glass Painting, the art of producing pictures upon glass with colors that are burned in, or by the use of pieces of colored glass, in which the color forms part of the composition of the glass itself. Originally there was but one method of making ornamental glass windows, which was by the latter process; the pieces of stained or colored glass were cut to the desired shape, and let into the grooves of finely-made leaden frames which formed the pattern in outline, so that the pictures resembled mosaic work. In the sixteenth century, the *enamel* colors having been discovered, a new process came into vogue, the designs being now painted on the glass and burned in. At the present day the two methods, or a combination of the two, are chiefly employed, the *mosaic-enamel* method being the most common, and consisting of a combination of these two.

Glass Paper (or Cloth) is made by strewing finely pounded glass on a sheet of paper or cloth which has been besmeared with a coat of thin glue, the glue being still wet. It is much used for polishing metal and wood work.

Glass Snake, a lizard, genus *Ophiosaurus*, in form resembling a serpent, and reaching a length of 3 ft. The joints of the tail are not connected by caudal muscles, hence it is extremely brittle, and one or more of the joints break off when the animal is even slightly irritated.

Glauber, John Rudolph (1603–1668), a German chemist. He is chiefly remembered for his discovery of sulphate of soda or *Glauber's Salt*, which he termed *sal mirabile*, in consequence of his great faith in its medicinal qualities.

Glauber's Salt, sulphate of sodium, so called because of the importance attached to its chemical and medicinal properties by Glauber. It forms large colorless monoclinic prisms, which effloresce on exposure to the air. It is soluble in water, and when heated melts in its water of crystallization. It is found in many localities, both dissolved in the water of mineral springs and of salt lakes, round which it effloresces.

Glazing is the covering of earthenware vessels with a vitreous coating in order to prevent their being penetrated by fluids. The materials of common glass would afford the most perfect glazing, were it not that a glazing of this sort is liable to cracks when exposed to changes of temperature. A mixture of equal parts of oxide of lead and ground flint is found to be a durable glaze for the common cream-colored ware, and is generally used for that purpose.

Glencoe (glen-kō′), a romantic Scottish valley in the county of Argyle, near the head of Loch Etive. It is bounded on both sides by almost perpendicular mountains over 3000 ft. high, and is traversed by a mountain stream, Ossian's "dark torrent of Cona." The valley was the scene of a tragedy known as the Massacre of Glencoe.

Glendower, Owen (1350–1415), a distinguished figure in Welsh history. He carried on a contest with Lord Grey de Ruthyn respecting an estate, and the latter being charged with the delivery of a summons to Owen from Henry, to attend him on his Scottish expedition, purposely neglected to deliver it. Glendower was outlawed for disaffection, and his enemy seized upon his lands. Glendower dispossessed Grey of his lands, and, having raised a considerable force, caused himself to be proclaimed Prince of Wales, 1400. He defeated the king's troops, and retiring to the mountains foiled all subsequent attempts to bring him to action. He afterward joined the coalition of the Percys, against Henry, and was crowned "sovereign of Wales."

Glenroy′, a deep valley in the Highlands of Scotland, parallel to Glenmore (the Great Glen), in Lochaber, Inverness-shire. It is nearly 14 mi. in length, and little more than one half mile in breadth, and is celebrated for its so-called *Parallel Roads*, which are three parallel terraces running along either side of the glen.

Glens Falls, Warren co., N. Y., on Hudson River, 59. mi. n. of Albany. Railroad, Delaware & Hudson Canal Co. In the vicinity are black marble and lime quarries. Principal industries: saw mills, machine shops, foundries, collar, cuff, and shirt factories, cigar factories, paper-pulp and grist mills. Pop. 1900, 12,613.

Globe, a sphere, a round, solid body, which may be conceived to be generated by the revolution of a semicircle about its diameter. An artificial globe, in geography and astronomy, is a globe of metal, plaster, paper, pasteboard, etc., on the surface of which is drawn a map, or representation of either the earth or the heavens, with the several circles which are conceived upon them, the former being called the *terrestrial globe*, and the latter the *celestial globe*. In the terrestrial globe the wire on which it turns represents the earth's axis, the extremities of it representing the poles. The *brazen meridian* is a vertical circle in which the artificial globe turns, divided into 360 de-

grees, each degree being divided into minutes and seconds. The brass meridian receives the ends of the axis on which the globe revolves. At right angles to this, and consequently horizontal, is a broad ring of wood or brass representing the horizon; that is, the true horizon of the earth which lies in a plane containing the earth's center. The horizon and brass meridian are connected with the stand on which the whole is supported. On the surface of the globe, as on other maps, are marked parallels of latitude, meridians, etc. On a globe of some size the meridians are drawn through every 15° of the equator, each answering to an hour's difference of time between two places. Hence they are called the *hour circles.* A number of *problems* or questions, many of them more curious than useful, may be solved by means of a terrestrial globe. Among the most important are such as to find the latitude and longitude of a place, the difference of time between two places, the time of the sun's rising and setting for a given day at a given place, etc.

Glommen, the largest river in Norway, issues from Lake Oresund, about 2,417 ft. above the sea level, in the southeast of South Trondhjem, flows generally s., and after a course of about 370 mi. falls into the Skagerrack at Frederikstadt.

Gloucester (glŏs′tẽr), a city, county of itself, parliamentary borough, and river port, England, capital of the county same name, on the left bank of the Severn, 95 mi. n. w. of London. It carries on a considerable shipping trade, the Gloucester and Berkeley canal giving access to the docks. The most remarkable public edifice is the cathedral. Other buildings are several handsome old churches, the shire hall, the guildhall, the bishop's palace, county schools of art and science, etc. The schools include the collegiate school, the theological college, the blue-coat school, and the grammar school of St. Mary de Crypt. The industries are rather varied. Gloucester, which formerly returned two, now sends one member to Parliament. Pop. 39,444.

Gloucester, Essex co., Mass., on Massachusetts Bay, 32 mi. n.e. of Boston. Railroad, Boston and Maine. Industries: net and twine co., granite quarries. Largest fishing port in North America. The town was first settled in 1623 and became a city in 1873. Pop. 1900, 26,121.

Gloversville, Fulton co., N. Y., 53 mi. n.w. of Albany. Railroad, Fonda, Johnstown & Gloversville. It has numerous factories and is the center of important mitten and glove manufactories. Pop. 1900, 18,349.

Gloves are coverings for the hand, or for the hand and wrist, with a separate sheath for each finger. They are made of leather, fur, cloth, silk, linen thread, cotton, worsted, etc. The chief leathers used in glove manufacture are doe, buck, and calfskin; sheepskin for military gloves; lambskin for much of the so-called kid gloves; true kid for the best and finest gloves; dog, rat, and kangaroo skins, etc. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Leather gloves are usually cut out by means of dies, and sewed by a machine of peculiar construction. The best woolen, thread, and silk gloves are made by cutting and sewing, but commoner gloves are made by knitting and weaving. Gloversville, N. Y., is the chief seat of the manufacture in this country. France supplies the world with most of the finer and more expensive gloves.

When the skins are brought to the factory they are dumped into pits which are filled with water and lime and kept here for about three weeks. In the meantime they are carefully watched and moved about with iron tongs. When they are lifted from the lime-water pits the hair is easily removed and the flesh on the inner part of the skin is taken off. They are then placed in clear, running water to remove the lime which has soaked in. After this the skins are placed in wheat bran mixed with warm water which makes them soft and pliable and removes all the dirt and impurities. The skins are then placed in a revolving drum with a mixture of the yolks of eggs, flour, alum, and salt. This mixture is worked into the skins and the process is kept up for an hour. The skins are then hung on racks in a hot room to dry. They are then wet in clear water again and worked by hand over a curved polished tool and stretched back and forth until the skin is wider and longer than it was originally and very pliable. The skins are then turned over to the shavers who shave the under part. The shaving makes the skin thin and delicate. They are then coated with a mixture of flour, oil, and the yellow of eggs, when they are put in clear water and patted with the feet or hands. They are then ready for the dyer. Ammonia is brushed over the skin and the dye is applied. Color is put on only one side. The skins are then assorted according to size and each skin will supply material for about three gloves, and one workman can cut about three dozen pairs a day. The gloves are first stitched on the back and the fingers are stitched in on a sewing machine in which the needle moves horizontally instead of up and down. The best gloves are hand-stitched. It is said that French dyers can give 330 tints to skins.

Glowworm, an insect of the genus *Lampyris,* of the order Cleoptera, or beetles, the name being strictly applicable only to the

Glowworm. *a.*—male; *b.*—female.

female, which is without wings, somewhat resembles a caterpillar, and emits a shining green light from the extremity of the abdomen. The male is winged and flies about in the evening, when it is attracted by the light

of the female, but gives out no light itself. It would seem that the glowworm possesses the power of moderating or increasing the light at will. Decapitated specimens retain their power of giving out light for a considerable time. In pure oxygen, warm water, or when crushed, the light of the luminous organs is increased in intensity. The larvæ are very voracious, living on snails, which they attack and kill.

Gloxin'ia, a genus of plants, nat. order Gesneraceæ, distinguished by the corolla approaching to bell-shaped, the upper lip shortest and two-lobed, the lower three-lobed with the middle lobe largest, and also by the summit of the style being rounded and hollowed. The species are natives of tropical America. They are valued as among the greatest ornaments of our gardens, owing to their richly colored leaves and their ample, graceful, delicately tinted flowers.

Gluck (gluk), Christoph Wilibald, Ritter von (1714–1787), German musical composer, b. in Bavaria. In 1740 he was employed to compose an opera for the court theater of Milan. The text chosen for him was the *Artaxerxes of Metastasio*, and the opera was a triumph, in spite of the innovations of style which the author introduced. In London Gluck became deeply impressed with the majestic character of Handel's airs and choruses, and with the simple but natural dramatic style of Dr. Arne. This visit to London, and a short trip to Paris, helped to develop that lyric genius which was destined to create a new order of musical composition. After producing many pieces of the usual class of opera at Paris, Vienna, Rome, and Naples, he returned to Vienna. He at last found a poet in the person of Raniero Calzabigi, who sympathized with him in his ideas, and the result of their co-operation was the *Orfeo ed Euridice*, performed publicly for the first time in 1762. This opera marked a new era. In 1766 his second great opera of *Alceste* was produced, which raised public feeling to the point of enthusiasm. In his dedication of this work to the Grand Duke Leopold of Tuscany he enunciates the principles of the new school, which shortly were that the opera should be a musical drama, not a concert in costume; that the text must be descriptive of real passion; that the music must voice fully the spirit of the text; that in accompaniments the instruments must be used to strengthen the expression of the vocal parts by their peculiar characters, or to heighten the general dramatic effect by employing them in contrast to the voice. Gluck now became convinced that his system must be tested on a wider field, and believed that the Royal Opera in Paris offered all a composer could demand. A Frenchman of culture and genius, Bailly du Rollet, adapted Racine's *Iphigénie en Aulide* for musical treatment, and the piece was brought out in 1774. The intensest excitement prevailed; all Paris took sides, and for a long time the Gluckists and Piccinists contended with much bitterness, but ultimately the victory remained with the Gluckists. Shortly after the production of the *Iphigénie*, the *Orfeo* was adapted for and put on the French stage, and was followed by the *Armide* in 1777, by the *Iphigénie en Tauride* in 1779, Gluck's last important work, and by many considered his greatest.

Glu'cose, a variety of sugar, less sweet than cane sugar, existing in grapes, and produced from cane-sugar, starch, dextrin, cellulose, etc., by the action of acids, certain ferments, and other re-agents. There are two varieties of it, distinguished by their action on polarized light, viz., *dextro-glucose* which turns the plane of polarization to the right; and *lævo-glucose*, which turns it to the left. When heated up to 400° it becomes caramel, and is used by cooks and confectioners as a coloring matter. It is called also *grape sugar* and *starch sugar*, and is produced both in the solid and in the liquid form, its manufacture being now of considerable importance. In the U. S., the liquid sugar, as prepared from Indian corn starch, is what is generally known as glucose, and it is used for various purposes, as for confectionery, canning fruits, making artificial honey, for table syrup, in brewing, etc.

Practically all the glucose turned out in this country is made from corn. In Europe potatoes are used largely. A bushel of corn yields about forty pounds of glucose. The first step in the process is the steeping of the corn, large wooden tanks being used for this purpose, and from 2,000 to 3,000 bushels of corn are run into these tanks and covered with water. The temperature of the water is kept up to about 80° F. during the whole steeping stage. The fumes of burning sulphur are blown into the tanks from below, and in this way the corn becomes strongly saturated with sulphuric acid. The object of this steeping process is to soften the corn so that it can be easily ground, and to dissolve the gummy substance which binds together the starch and the gluten. The steeping process requires from one to three days. Next the corn is washed with fresh water and taken to the mill. There it is ground between heavy mill stones or rollers. If a grain of corn is examined it will be found that on the pointed end of the grain, is a soft, pliable mass which can be easily removed from the starchy part of the grain with a penknife. This soft part is the germ, and if pressed will exude an oily substance. There is about fifty per cent. of oil in the germ. It is valuable as a salad oil, and is used in making toilet soaps and mixing paints. The germs are separated from the starchy matter. This is done before it is thoroughly ground by running it between corrugated rolls. The crushed corn is then run into a tub of starchy water, which is stirred mechanically. The germs are much lighter than the starch and float to the surface of the water and are washed away. The germs are freed from the greater part of water they contain by rotation in a centrifugal machine. They are then dried in hot air, ground, and shaped into cakes. The cakes are put into a powerful hydraulic press, subjected to a pressure of 4,000 pounds, and the oil runs

out in a steady stream. The cakes that remain are sold for cattle food. The starchy mass left after the germs have been extracted is now ground until all of it has disappeared. Makers of glucose recognize four substances in corn—starch, gluten, oil, and bran. The germs contain nearly all of the oil and a large part of the gluten, and they carry with them some of the bran. It is necessary to separate the remaining bran and gluten from the starch. The ground material is run into a tank and mixed with water until it has the necessary consistency, and it is then forced on to a mechanical sieve known as a shaker. The shaker is a frame about 8 ft. long by 3 ft. wide, covered with fine bolting cloth. It is inclined at an angle of thirty degrees to the horizontal, and in order that the corn may move along it in a steady stream, flowing into the screen at the upper end, and dropping off at the lower end, the screen is kept in constant vibration. Jets of water play upon the screen at different points, and serve to wash away the fine particles of starch and gluten from the bran. The bran drops off from the end of the screen and is carried away. At this point there is left a yellowish milky mash containing starch and gluten. The starch is considerably heavier than gluten and they are separated. The milky liquid is allowed to run over slightly inclined tables about 200 ft. long. The starch settles near the head of the tables in great quantities and in lesser quantities throughout the length of the tables. The gluten floats away with the water and runs through a pipe at the end of the tables into a large settling tank. It is allowed to settle for a day or two and the water is run into the sewer. The gluten that is left in the tanks still contains a large amount of water. Most of this is removed by forcing it into a filter press which retains the gluten and allows the water to escape. The press consists of a series of grooved iron plates with a central orifice; cloths are placed between the plates in such a manner that the solid gluten cannot pass the cloths, but must remain between them and the plates, while the water escapes through the pores of the cloth and leaves the press by suitable opening. The liquid enters the press by the central orifice. After the spaces between the places have become filled with the gluten, the pressure is removed by means of a screw, and the cakes of gluten are removed after separating the plates. The gluten is then thoroughly dried by means of hot-air or steam dryers. It is then placed in bags and is ready for the market. It sells for about $20 a ton and is a valuable cattle food.

Here the preparation of glucose proper begins. The starch is well mixed with water in a tank, and is pumped into the converters, where it is mixed with about 25 pounds of muriatic and sulphuric acid. The converter is a large copper boiler, into which steam is introduced by means of a perforated pipe. The starch is heated in the converter for about an hour, at a pressure of thirty to forty pounds. The heating is done entirely with steam. The

conversion is finished when a simple mechanical test shows that no more starch is present. The action in the converter is a chemical change from starch to glucose, or grape sugar, as it is sometimes called. After the conversion is complete, the operator opens a valve, and allows the glucose to enter the neutralizing tank. The glucose is then a yellowish-brown liquid, containing about thirty per cent. of solid matter. The acids which are added to the starch are still present in the glucose, and the next operation is the addition of a neutralizing agent. If muriatic acid was used for converting, soda is used for neutralizing; and if sulphuric acid was used, marble dust is added for this purpose. After the material is neutralized some solid matter separates, which is removed by filtration. A weak solution of glucose is known as "press liquor" at this stage. It must be clarified by passing it over filters of bone coal. These filters are iron tanks filled with animal charcoal, or bone coal. Animal charcoal will absorb coloring matter from sugar solutions, and absorbs only a small amount of sugar. After this process the liquor is perfectly clean. The liquor is evaporated in a vacuum. The evaporation is continued until the liquor contains about 60 per cent. of sugar. It is again filtered over bone coal to remove any remaining color and is then boiled in a vacuum pan until it has reached the desired degree of concentration. Glucose comes on the market in different grades according to the density. Glucose is a thick syrup, and if pure it is perfectly clear and colorless. There are about half a dozen glucose factories in operation in the U. S. These factories use from 10,000 to 30,000 bushels of corn in a day. Glucose is principally used for candy and syrup.

Glue, a gelatinous substance obtained from different tissues of animals, and used as a cement for uniting pieces of wood or other material. Near seaboard towns it is largely made of the heads and offal from fish-curing establishments. In the West, glue is made from the heads, feet, sinews, and bones of cattle, sheep, and hogs, and from the ears, horn piths, fleshings, intestines, and bits of hide which come from the slaughter houses. The heads, bones, etc., that are free from dirt or hair are generally carried direct to the boiling vats. The remainder are put into dump carts and drawn up an inclined plane, where they are dumped and sorted into piles. The washers are ranged along under this floor. They resemble in appearance huge barrels, 10 or 15 ft. in diameter, revolving on a shaft and driven at one end by power. Corresponding to the bunghole is a trapdoor. This is brought directly under a trapdoor in the floor above, and the washer is about half filled with glue stock. Water is added until it is about three quarters full. Then a quantity of acid is put in to assist in the operation, the trap door is closed, and the whole revolved. After the washing, the stock is again loaded into dump carts, the clean stock being taken to the boilers, while the hide stock is taken outside to the lime vats. Here they are

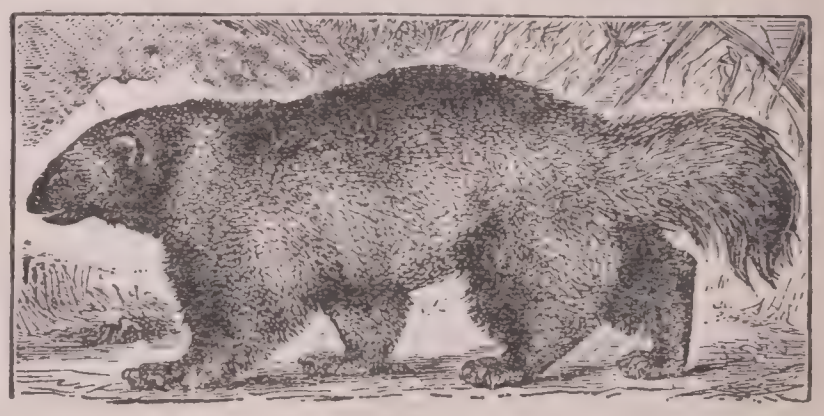
packed in lime and worked over with shovels until the hair is thoroughly loosened, and whatever fat there may have been on the pieces is converted into lime soap. When this is accomplished the stock is carted to another washer. This second washer is under a large outdoor shed, and is merely a circular opening in the floor, about 30 ft. in diameter and 3 ft. deep, lined with cement. A constant stream of water enters from one side of the basin, and after it becomes about half full, an opening on the opposite side allows the dirty water to escape. A driving shaft comes up from this basin, and about midway from the bottom of this shaft and the ceiling, an arm extends, reaching to the outside edge of the basin. From the end of this arm a chain connects with a shaft at the large end of a large, conical wooden roller, the small end of which has the driving shaft in the center. The stock is thrown into this basin, and when the central shaft revolves the arm and chain pull this roller round and round in the basin, squeezing out the lime from the stock, clearing it from hair, and leaving it clean and ready for the boiling tanks. At the other end of the building, on a raised floor, there is an endless belt with buckets attached. Each bucket brings up from the floor below a cattle head, fresh from the animal, which it deposits in a truck standing beside it. A little farther on is the boiling room. Here are a number of vats raised about 3 ft. from the floor. The boiling vats are about 20 to 30 ft. across the top and extend from the third story to the basement. It takes about 8 hours for one boiling, and it requires 4 to 6 boilings to completely extract the glue from the stock. When the boiling is complete the liquid glue is pumped into vats in the fourth story of another building. These vats are about 20 ft. square and 6 ft. deep. In the first vat there is a liquid resembling in appearance bouillon. This has been colored by mixing in a white, pasty substance, looking like white lead and oil, and it will make white glue when dried. The next vat contains a mixture which resembles beef tea. This is the regular run of glue, uncolored.

Flat trucks loaded with galvanized iron dishes are wheeled in front of these vats and poured full of the hot glue, whence they are shoved into the chill room and the glue allowed to set. When the glue is finally set it is of about the consistency of soft rubber. When it reaches this state, the trucks are wheeled from the chill room to the end of a long room, and the dishes with their contents are placed bottom up at the end of a long track over which two endless chains run, one on either side, connected about every four feet by a strip of wood. The dish is first drawn into a steam chamber where the heat loosens the dish from the glue, and as it emerges on the other side of the steam chamber, the dish is lifted and the hot cake of glue is left on the board. A little way from the steam chamber a wire is stretched across the track about half an inch from the bottom of the cake of glue, and as the glue is drawn along, the wire cuts through it, leaving a strip about half an inch thick on the bottom of the cake. A little farther on another wire cuts off another slice of the same thickness, so that when the glue reaches the other end of the track it is sliced lengthwise into sheets about half an inch thick. At the end the cakes are cut crosswise into four pieces. The pieces are placed on a wire netting stretched on a frame. When the frame is full it is carried to a truck near by, which is wheeled away to the drying-rooms where it remains until the glue is hard. The sheets of glue are sometimes packed in barrels as they come from the drying room, each piece being handled separately.

Gelatin is made by exactly the same process as glue and from exactly the same materials except that more care is taken in selecting the parts of the animal to be used, and also in cleaning the parts. After coming from the cooling room gelatin is spread much thinner on the wire netting than glue, and when it is dry it is cut up into pieces about 6 in. long by 3 in. broad, and in this form is ready for the market. Sometimes, however, it is broken up into fine pieces and placed in small paper packages. Isinglass, or fish glue, is another product of the glue factory, and is used as a gum for the sealing of letters, and also in the making of confectionery.

Gluten, a tough elastic substance of a grayish color, which becomes brown and brittle by drying, found in the flour of wheat and other grain. It contributes much to the nutritive quality of flour, and gives tenacity to its paste. A similar substance is found in the juices of certain plants.

Glutton, a carnivorous quadruped, about the size of a large badger, and intermediate between the bear family and the weasels, resembling the former family in general structure and the latter in dentition. It inhabits Northern Europe and America, and is known also



The Glutton.

by the name of *Wolverene* or *Wolverine.* The glutton is slow and deficient in agility, but persevering, cunning, fierce, and of great strength. It prefers putrid flesh, and has an extremely fetid odor. The fur is valuable, that from Siberia being preferred from its being of a glossy black.

Glycerine, a transparent colorless liquid, chemically described as a triatomic or trihydric alcohol, obtained from the bye-products of candle and soap factories by saponification with alkalies or by the action of superheated steam.

It has a sp. gr. 1.267 and sometimes solidifies at a low temperature to a crystalline mass. It absorbs moisture from the air, and dissolves in or mixes with water and alcohol in all proportions, but is insoluble in ether. It acts as a solvent both on inorganic and organic bodies. The uses of glycerine are very numerous. In the arts it is used wherever a substance requires to be kept more or less moist, for example modeling clay, tobacco, paper for printing, etc.; also in spinning, weaving, rope making, and tanning. It is an excellent preservative medium for meat, and for natural history specimens; and its property of lowering the freezing point of water makes it useful in gas meters, floating compasses, and the like. It is also the starting point of certain valuable chemical products, one of the chief of which is nitroglycerine.

Gmelin (gmel'in), JOHANN GEORG (1709-1755), a German naturalist, born in Tübingen. On taking his medical degree he went to St. Petersburg, and became professor of chemistry and natural history. In 1733 he took part in an exploring expedition to Siberia, returning to St. Petersburg in 1743, where he published his *Flora of Siberia*. He became professor of botany and chemistry at Tübingen in 1749, and published *Travels in Siberia* (1752).

Gnapha'lium, a genus of widely-spread composite plants having their foliage usually covered with a white woolly down, and their flower heads of the "everlasting" kind. The cotton-wood, common in the U. S., belongs to this genus.

Gnat, the name applied to several species of insects. The common gnat is of wide geographical distribution, and is noted for its power of inflicting irritating wounds. The proboscis or sting of the female is a tube containing four spiculæ of exquisite fineness, dentated or edged; these are modified mandibles and maxillæ. The males do not sting, and are further distinguished by their plume-like antennæ.

Life History of the Gnat.
a.—larva; *b.*—pupa; *c.*—perfect insect emerging; *d.*—male; and *e.*—female gnat.

These insects also feed on the juice of plants. The female deposits her eggs on the surface of stagnant water in a long mass. After having remained in the larva state for about twenty days, they are transformed into chrysalids, in which all the limbs of the perfect insect are distinguishable, through the diaphanous robe with which they are then shrouded. After remaining three or four days wrapped up in this manner, they become perfect insects. The troublesome mosquito belongs to the same genus.

Gneisenau (gnī'zn-ou), AUGUST WILHELM ANTON, COUNT NEIDTHARD VON (1760–1831), Prussian general. He served with the German auxiliaries of England in America; and as chief of Blücher's staff chiefly directed the strategy of the Prussian army at Waterloo. He was made field-marshal in 1831.

Gneiss (nīs), a species of rock, composed of quartz, feldspar, and mica, arranged in layers. The layers, whether straight or curved, are frequently thick, but often vary considerably in the same specimen. Gneiss passes on one side into granite, from which it differs in its foliated structure, and on the other into mica slate. It is rich in metallic ores, gold, silver, cobalt, antimony, copper, iron, etc., occurring in this rock, but it contains no fossil remains. Porphyritic gneiss presents large distinct crystals of feldspar which traverse several of the foliated layers. Gneiss often contains hornblende in place of mica, and then receives the name of syenitic gneiss. The only difference between this rock and granite consists in the foliation of gneiss, the materials of granite being crystallized promiscuously, those of gneiss being segregated in layers. It is the principal rock of very extensive districts; it predominates in Norway, and all the n. of Europe. It abounds in the Southern Alps and the Pyrenees, and forms the loftiest chains of the Andes of Quito. In the U. S. gneiss is a common rock, especially in New England and the eastern and southern parts of New York.

Gneist (gnīst), HEINRICH RUDOLF HERMANN FRIEDRICH, German jurist, b. at Berlin 1816, studied at the university there, in which, in 1844, he became professor-extraordinary, and in 1858 ordinary professor. He has also taken part in politics as a member of the Prussian House of Deputies, and of the diet of the German Empire, ranging himself on the liberal side. He has written extensively on law, constitutional history, etc.

Gnostics (nos'tiks), a general name applied to early schools of speculators, which combined the fantastic notions of the Oriental systems of religion with the ideas of the Greek philosophers and the doctrines of Christianity. They nearly all agreed on the points that God is incomprehensible; that matter is eternal and antagonistic to God; that creation is the work of the *Demiurge*, an emanation from the Supreme Deity, subordinate or opposed to God; and that the human nature of Christ was a mere deceptive appearance. The dogmas of the earliest Gnostics may be reduced to the following heads: God the highest intelligence, dwells at an infinite distance from this world, in the Abyss, removed from all connection with every work of temporal creation. He is the source of all good; matter, the crude, chaotic mass of which all things were made, is, like God, eternal, and is the source of all

evil. From these two principles, before time commenced, emanated beings called *æons*, which are described as divine spirits, inhabiting the Plerōma, or plenitude of light, which surrounds the Abyss. The world and the human race were created out of matter by one æon, the Demiurge, or, according to the later systems of the Gnostics, by several æons and angels. The æons made the bodies and the sensual soul of man of this matter; hence the origin of evil in man. God gave man the rational soul; hence the constant struggle of reason with sense. What are called gods by men are merely such æons or creators, under whose dominions man became more and more wicked and miserable. To destroy the power of these creators, and to free man from the power of matter, God sent the most exalted of all æons, to which character Simon first made pretensions. Cerinthus, a Jew, of whom John the evangelist seems to have had some knowledge, combined such reveries with the doctrines of Christianity, and maintained that the most elevated æon sent by God for the salvation of man, was Christ. The second was the school of Alexandria, and the third was represented by Marcion of Pontus. There have been no Gnostic sects since the fifth century.

Gnu, the wild beast of the colonists, the name given to two species of South African antelope. Both sexes have horns projecting slightly outward and downward, then forming an abrupt upward bend. They have bristly black hair about the face and muzzle, a white stiff mane, and horse-like tail. They attain a length of about 9 ft. and stand about 4 ft. high

Gnu.

at the shoulder. They live in herds; are said to be fierce when attacked, but when taken young have been found to be capable of domestication. The brindle gnu is larger than the common gnu, has black stripes on the neck and shoulders, and a black tail. Both species wheel in a circle once or twice before setting off when alarmed.

Goat, a well-known horned ruminant quadruped of the genus *Capra*. The horns are hollow, erect, turned backward, annular on the surface, and scabrous. The male is generally bearded under the chin. Goats are

nearly of the size of sheep, but stronger, less timid, and more agile. They frequent rocks and mountains, and subsist on scanty coarse food. Their milk is sweet, nourishing, and medicinal, and their flesh furnishes food. Goats are of almost interminable variety, and it is not certainly known from which the domestic goat is descended, though opinion favors the wild goat of Western Asia. Goats are generally subdivided into ibexes and goats

The Bezoar Goat.

proper. They are found in all parts of the world, and many varieties are valued for their hair or wool. The skin is prepared for a variety of purposes, and yields the leather well known under the name of *morocco*. The Cashmere goat, as its name indicates, is a native of Cashmere; it is smaller than the common domestic goat, and has long, silky, fine hair. The Angora goat is also furnished with soft silky hair of a silver-white color, hanging down in curling locks 8 or 9 inches long. Its horns are in a spiral form, and extend laterally.

Goat Island, a small island of 70 acres, which divides the current of the Niagara River at the Falls. It is connected with the American shore by a bridge.

Goatsucker (or Nightjar), a name common to the birds of the genus *Caprimulgus*, as also to all belonging to the same family—the Cap-

The Nightjar.

rimulgidæ, given originally from the erroneous opinion that they suck goats. The chuck-will's widow, whip-poor-will, and night hawk belong to this family.

Gobi, DESERT OF, the *Shamo* or "sand-sea" of the Chinese, an immense tract of desert country, occupying nearly the center of the high table-land of Eastern Asia, extending over a large portion of Mongolia and Chinese Turkestan. Its length is probably about 1,800 mi.; mean breadth, between 350 and 400 mi.; area 300,000 sq. mi. Its general elevation is over 4,000 ft. above sea level. The East Gobi is occupied by different tribes of the Mongolian race, who have numerous herds of camels, horses, and sheep. This tract is supposed at one time to have been a great inland sea.

God, the Supreme Being, worshiped by most civilized nations. The Christian God is an infinite and absolute being; a perfect personal spirit; eternal; immutable; omniscient; omnipotent; and perfectly good, true, and righteous. The arguments for the existence of God have been divided into the ontological, the cosmological, and psychological, the physico-teleological, and the moral. The ontological argument starts from the idea of God itself, and professes to demonstrate the existence of God as a necessary consequence from that idea. The manner in which it was stated by Anselm in the eleventh century, is this: "God must be thought of as that being than whom none can be thought greater; but this being, the highest and most perfect that we can conceive, may be thought as existing in actuality as well as in thought—that is to say, may be thought as something still greater; therefore God, or what is thought as greatest, must exist not only in thought but in fact." This argument has been presented in other forms. Descartes, while refuting Anselm's form of the ontological argument, revived it himself in another form. Applying the test of truth which he derived from his celebrated formula—"I think, therefore I am," that whatever we clearly and distinctly perceive to belong to the true and unalterable nature of a thing may be predicated of it, he found on investigating God that existence belongs to his true and unalterable nature, and therefore may legitimately be predicated of him. Another argument was adduced by Descartes to prove the existence of God, which, although not the same with the ontological argument, appears to resemble it. It is called the psychological argument. Like the ontological argument, it starts from the idea of a supreme and perfect being, but it does not assert the objective existence of that being as implied in its idea, but infers such objective existence on the ground that we could have acquired the idea only from the being which corresponds to it. The cosmological argument starts not from an idea, but from a contingent existence, and infers from it an absolutely necessary being as its cause. Stated syllogistically the argument is: Every new thing and every change in a previously existing thing must have a cause sufficient and pre-existing. The universe consists of a system of changes. Therefore the universe must have a cause exterior and anterior to itself. The argument called the physico-teleological is that which is commonly known as the argument from design, which has been so fully illustrated by Paley in his *Natural Theology*. It is simply this, that in nature there are unmistakable evidences of the adaptation of means to ends, which lead us inevitably to the idea of one that planned this adaptation, that is, of God. The moral argument is derived from the constitution and history of man and his relations to the universe, being based on such considerations as our recognition of good and evil, right and wrong, the monitions of conscience, and the fact that a moral government of the world may be observed. Another argument is based on the (alleged) fact that a belief in the existence of a Supreme Being is everywhere found to be implanted in the breast of man. This argument is used among others by Cicero, and many thinkers are inclined to give a good deal of weight to it; still it is pronounced by others to be at best only a probable argument, if it may be accepted as valid to prove anything at all. Others argue the existence of God from the manifestations which he has made of himself to men, but these, as well as miracles, it is admitted even by Christian theists, can only be accepted as real by such as previously believed in the divine existence.

Goda'vari, a large river of Central India, which rises about 50 mi. from the shore of the Indian Ocean, flows across the Deccan from the Western to the Eastern Ghats in a general southeasterly direction, and being joined by several affluents, falls by three principal mouths into the Bay of Bengal, after a course of 900 mi. Before the river divides there are three great obstacles to navigation, caused by three rocky barriers. GODAVARI is also the name of a British district of the Madras presidency, area 7,345 sq. mi.; pop. 1,791,512. Coringa and Coconada are its chief ports.

Godfrey of Bouillon (1061–1100), leader of the first Crusade, son of Eustace II, count of Boulogne, b. near Nivelles. He distinguished himself while fighting for the Emperor Henry IV in Germany and Italy, and was made duke of Bouillon. In order to expiate his sin of fighting against the pope, he took the cross for the Holy Land in 1095, and led 80,000 men to the East by way of Constantinople. The defeat of the Egyptians at Ascalon placed him in possession of all the Holy Land, excepting two or three places. Godfrey now turned his attention to the organization of his newly-established government, and promulgated a code of feudal laws. Godfrey was a favorite subject of mediæval poetry, and is the central figure of Tasso's *Jerusalem Delivered*.

Godfrey of Strassburg, a German poet who flourished about 1200. Besides many lays, we are indebted to him for the great chivalric poem *Tristan und Isolde*, derived from the legends of the *Round Table*.

Godoy, MANUEL (1767–1851), duke of Alcu-

dia, better known as the Prince of the Peace, was b. at Badajoz. In 1791 he became adjutant general of the guards, in 1792 lieutenant-general, marquis of Alcudia, grandee of Spain of the first class, and prime minister; and in 1795, as a reward for the part he had taken in concluding peace with France, he was presented with a large and valuable landed estate, and made a knight of the Golden Fleece. As he used his vast power in the promotion of French more than Spanish interests, he became extremely unpopular, and the hatred of the people became so great in 1808 that he had to take refuge in France. In 1847 he was permitted to return to Spain and resume his titles.

Godwin, Earl of Wessex (990–1052), an Anglo-Saxon noble. During the reign of Edward the Confessor a quarrel arose between Godwin and the king, occasioned by the partiality of Edward for Norman favorites, and Godwin was compelled to quit the kingdom. In 1052, however, he returned with an army, forced Edward to enter into negotiations with him, re-established himself triumphantly in his old supremacy, and caused the expulsion from the kingdom of most of the Norman intruders.

Godwin, MARY (1759–1797), also well known by her maiden name of Wollstonecraft, b. in or near London. In 1786 she published *Thoughts on the Education of Daughters.* This was followed by an answer to Burke's *Reflections on the French Revolution*, the *Vindication of the Rights of Woman*, and other works.

Godwin, WILLIAM (1756–1836), English novelist and writer. In 1793 appeared his *Inquiry Concerning Political Justice*, the liberal tone of which exposed him to some danger of a government prosecution. The next year appeared his novel of *Caleb Williams, or Things as they Are*, which rapidly and deservedly attained an immense popularity. His cursory strictures on Judge Eyre's charge to the jury in the trial for high treason of Holcroft, Horne Tooke, and others, contributed materially to the acquittal of his friends. In 1797 he published the *Inquirer*, a collection of essays on moral and literary subjects; and in April of the same year he married Mary Wollstonecraft. A memoir of his wife was published by Godwin in 1798, along with her posthumous literary works. In 1799 he published a new novel, *St. Leon.* Among his subsequent works are: *Faulkner*, a tragedy; an *Essay on Sepulchres; Mandeville*, a novel; *A Treatise on Population*, in reply to Malthus, etc.

Goethe (*geu'tĕ*), JOHANN WOLFGANG VON (1749–1832), the greatest figure in German literature, was b. at Frankfort-on-the-Main. His father, who was a Doctor of Laws and imperial councillor, was a well-to-do citizen, and an admirer of the fine arts. At an early age young Goethe learned the French language practically; and a French theatrical company, performing at Frankfort, awakened his taste for dramatic performances. Drawing, music, natural science, the elements of jurisprudence: and the languages, occupied him alternately. After the breaking off of a youthful love affair, which gave a name to the heroine of his great work, *Faust*, and some features to his *Wilhelm Meister*, he was sent to the University of Leipsic to prepare himself for the legal profession, but he did not follow any regular course of studies. Goethe began at this period what he practised throughout his life, to embody in a poem, or in a poetical form, whatever occupied his mind intensely; and no one, perhaps, was ever more in need of such an exercise, as his nature continually hurried him from one extreme to another. In 1768 he left Leipsic, and after an illness of some length he went in 1770 to the University of Strassburg, to pursue the study of law, according to the wish of his father. At Strassburg he became acquainted with Herder—a decisive circumstance in his life. Herder made him more acquainted with the Italian school of the fine arts, and inspired his mind with views of poetry more congenial to his character than any which he had hitherto conceived. In 1771 he took the degree of Doctor of Jurisprudence, and wrote a dissertation on a legal subject. He then went to Wetzlar to practise law, where he found, in his own love for a betrothed lady, and in the fate of a young man named Jerusalem, the subjects for his striking work, *The Sorrows of Werther*, which formed an epoch in German literature. The attention of the public had already been attracted to him, however, by his drama *Götz von Berlichingen.* Not long after the publication of *Werther*, Charles Augustus, the hereditary duke of Saxe-Weimar, made the acquaintance of Goethe on a journey, and when in 1775 he took the government into his own hands, he invited Goethe to his court. Goethe accepted the invitation, and on Nov. 7, 1775, arrived at Weimar. Wieland was already there, having been the duke's tutor; Herder was added to the band in 1776; Schiller was afterward one of its members for a few years; and other poets and critics and novelists were gathered round these chiefs. Goethe was the leading spirit of the group even during the last quarter of the eighteenth century, when these men and others were constructing and guiding the literature of all Germany; and his supremacy became yet more absolute afterward, when for another generation he stood alone. In 1776 he was made privy councillor of legation, with a seat and vote in the privy council. In 1782 he was made president of the chamber, and ennobled. In 1786 he made a journey to Italy, where he remained two years, visited Sicily, and remained a long time in Rome. This residence in Italy had the effect of still further developing his artistic powers. Here his *Iphigenia* was matured, *Egmont* finished, and *Tasso* projected. In 1790 was published the earliest form of the first part of *Faust*, with the title *Doctor Faust, ein Trauerspiel* (*Doctor Faust, a Tragedy*), a poem in a dramatic form, which belongs rather to Goethe's whole life than to any particular period of it. At the time that Goethe was engaged in the production of these works of imagination he had been pursuing various other studies of a scientific nature

with as ardent an interest as if these had belonged to his peculiar province. The result of his studies in botany was a work published also in 1790, in which he gives expression to the view that the whole plant, and its different parts, may all be regarded as variously modified leaves. In the following year (1791) he began to apply himself to optics, and in 1791–92 he published a work on this subject called *Beiträge zur Optik.* On May 1, 1791, he became director of the court theater at Weimar. In 1792 he followed his prince during the campaign of the Prussians against the revolutionary party in France, and was present at the battle of Valmy on September 20. At the Weimar Theater he brought out some of the dramatic *chefs-d'œuvre* of Schiller, and there, too, his own dramatic works first appeared, *Goetz von Berlichingen*, *Faust*, *Iphigenia in Taurus*, *Tasso*, *Clavigo*, *Stella*, and *Count Egmont.* In 1794–96 Goethe published *Wilhelm Meister's Lehrjahre* (*Wilhelm Meister's Apprenticeship*), a novel which has become well known to English readers through the translation of Carlyle, and which had as a continuation *Wilhelm Meister's Wanderjahre* (that is, his travels as a journeyman), 1821. His next work of importance was *Hermann und Dorothea* (1797), a narrative poem, in hexameter verse, the characters of which are taken from humble life. In 1806 Goethe married Christiane Vulpius, with whom he had lived since 1788, and of whom he always spoke with warmth and gratitude for the degree in which she had contributed to his domestic happiness. In 1808 he published another edition of *Faust* in a considerably altered form. In 1809 was published *Wahlverwandtschaften* (*Elective Affinities*), another novel, and in 1810 the *Farbenlehre* (or *Theory of Colors*), a work in which he had the boldness to oppose the Newtonian theory, and to which Goethe himself attached great importance, although the theory therein promulgated has met with no acceptance among men of science. In 1811–14 appeared Goethe's autobiography, in 1819 the *Westöstlicher Divan*, a remarkable collection of Oriental songs and poems. Goethe's last work was the second part of *Faust*, which was completed on the evening before the last anniversary of his birthday which he lived to see.

Gog and Magog.—Ezekiel predicts the destruction of Gog and Magog by the Jews, and mention is also made of them in Revelation. Interpreters generally understand them to be symbolical expressions for the heathen nations of Asia. Gog and Magog are also the names given to two reputed giants of early British history, whose statues are erected in the Guildhall in London.

Gogol, Nikolai Vassiljevich (1809–1852), Russian author, b. in the province of Poltava. He went to St. Petersburg in 1829 and tried the stage, but failing, found his true vocation in literature. His works are extremely popular in Russia for their graphic and humorous delineation of every-day life and manners, and more especially Russian country life.

Gokcha (Goktscha), a lake in Russian Armenia, occupying a triangular cavity 540 sq. mi. in extent, at an elevation of 6,400 ft. above the sea. It receives the water of several streams without having any considerable outlet.

Gold is a precious metal of a bright yellow color, and the most ductile and malleable of all the metals; symbol Au, atomic weight 196. It is one of the heaviest of the metals, and not being liable to be injured by exposure to the air, it is well fitted to be used as coin. Its ductility and malleability are very remarkable. It may be beaten into leaves so exceedingly thin that 1 grain in weight will cover 56 sq. in., such leaves having the thickness of only 1–282000 part of an inch. It is also extremely ductile; a single grain may be drawn into a wire 500 ft. long, and an ounce of gold covering a silver wire is capable of being extended upward of 1,300 mi. It may also be melted and remelted with scarcely any diminution of its quantity. It is soluble in nitro-muriatic acid or *aqua regia*, and in a solution of chlorine. Its specific gravity is 19.3, or it is about nineteen times heavier than water. The fineness of gold is estimated by carats, pure gold being 24 carats fine. Jeweler's gold is usually a mixture of gold and copper in the proportion of three fourths of pure gold with one fourth of copper. Gold is seldom used for any purpose in a state of perfect purity on account of its softness, but is combined with some other metal to render it harder. Standard gold, or the alloy used for the gold coinage, consists of twenty-two parts of gold and two of copper (being thus 22 carats fine). Articles of jewelry in gold are made of every degree of fineness up to 18 carats, i. e., 18 parts of gold to 6 of alloy. The alloy of gold and silver is found already formed in nature, and is that most generally known. It is distinguishable from that of copper by possessing a paler yellow than pure gold, while the copper alloy has a color bordering upon reddish yellow. Palladium, rhodium, and tellurium are also met with as alloys of gold

Gold has been found in smaller or larger quantities in nearly all parts of the world. It is commonly found in reefs or veins among quartz, and in alluvial deposits; it is separated, in the former, by quarrying, crushing, washing, and treatment with mercury. The rock is crushed by machinery, and then treated with mercury. which dissolves the gold, forming a liquid amalgam; after which the mercury is volatilized, and the gold left behind; or the crushed ore is fused with metallic lead, which dissolves out the gold, the lead being afterward separated by the process of cupellation. In alluvial deposits it is extracted by washing, in dust, grains, laminæ, or nuggets. In modern times large supplies of gold were obtained from Peru, Bolivia, and other new countries. Till the discovery of gold in California a chief source of the supply was the Ural Mountains, in Russia. An immense increase in the total production of gold throughout the world was caused by the discovery of gold in California in 1848, and that of the equally rich gold fields

of Australia in 1851. Latterly the yield from both sources has considerably decreased. Gold mines have also been extensively worked in New Zealand. British Columbia and Vancouver are the chief Canadian gold fields, but the metal is also found in Saskatchewan, Ontario, New Brunswick, and elsewhere in the dominion. In the U. S., apart from California, gold in considerable quantities is found in many states and territories, chiefly Colorado, Dakota, Idaho, Montana, and Nevada. Among the other places where gold has lately been found in sufficient quantity to hold out the hope of being profitably searched for, are New Caledonia, the colony of Natal, and other parts of South Africa. In the latter country the whole region between the Limpopo and the Zambezi rivers appears to be auriferous. Gold has been found also in many parts of the United Kingdom, as in Sutherlandshire, the Wicklow hills, and many places in Wales, especially near Dolgelly, where auriferous quartz reefs are now being worked on a large scale. The value of the gold produced from the years 1493 to 1875 is estimated at $4,643,087,395; and from the year 1875 to 1890 at $1,508,980,000. The present total annual production throughout the world may amount in value to $120,000,000. Enormous quantities of gold are consumed in the arts and are lost by wear of coin and jewelry.

Gold Beating, the art or process of producing the extremely thin leaves of gold used in gilding, etc. The gold which is beaten into leaf is almost pure metal which has been melted at a greater temperature than fusibility requires. This extra heat gives the gold a greater malleability. It is cast into bars or flat ingots and sent to the gold beater in that form. The workman rolls it into a long thin ribbon about 2½ in. wide and then cuts the ribbon into squares. These squares are placed between a peculiar paper known as "French" paper. It looks like exceedingly close-grained oil paper and each sheet is about 5 in. square. Three hundred sheets are piled on one another, and a square of gold is laid on the "French" paper between each sheet. This forms a book, or as the gold beaters call it, a "cutch." The gold beater slips over it the bands of parchment, binding all the leaves with the gold squares between them into a solid block. The cutch is laid on a block of stone which has been faced up square, and with a twenty pound cast iron hammer the gold beater begins to flatten out the gold. The hammer falls on the center of the cutch for a time thus driving the gold out. The cutch is beaten nearly half an hour, and about that time the gold has expanded to the size of the sheets of French paper. Each sheet of gold is removed and cut into four squares so that each sheet is evenly squared. The leaves of gold are cut with a "filling wagon" which consists of two pieces of sharp-edged reed or bamboo set in a frame so that the parallel cutting edges will divide the leaf into the proper size in one cut. The leaf is cut on a soft piece of leather so that steel knives cannot be used. The leaf is handled with pincers made of boxwood. The quartered sheets are laid in the "shoder," which is like the cutch except that the leaves are gold beaters' skin. About 1,000 of the gold squares are filled in the shoder and it is beaten with a twelve-pound hammer for an hour. Again the leaves are cut into quarters and placed in the "mold," which like the shoder is made up of gold beaters' skin, and the hammer pounds it for nearly seven hours until the gold is spread out to the size of the mold. The leaves are then ready to be cut into squares three and three-eighths in. on a side and laid in books, 25 leaves to each book, and 20 books to a pack, so that a pack contains 500 sheets of gold leaf.

Silver is beaten in the same way. The gold beaters' skin is a fine membrane taken from a particular part of the intestines of an ox. It is cut into pieces 25 or 30 in. long and the fat is removed by dipping it into a potash solution. It is then scraped with a blunt knife and stretched on a form. Two membranes are glued together and cured with a preparation of isinglass, and then coated with the white of an egg. The membrane is cut into five and five and a half in. squares, and it requires nearly 500 oxen to furnish skins to fill a mold of 1,000 pieces. The skin is used only in the mold and will last for about 200 beatings. It is then used in the shoder. Aluminum leaf is also an important product, and is made in the same manner as gold leaf. Archæologists have found that gold leaf on jars and other household utensils were made 2,000 years B.C. The art was well known in the time of Homer and Pliny. African travelers have found natives who were quite expert in hammering gold into fine sheets. Dentists use gold leaf for filling teeth because gold will weld into a solid mass when cold. The dentist's gold leaf is not put through the shoder and mold, but is taken from the cutch, as they use a heavier leaf than gilders, bookbinders, and sign painters.

Gold Coast, a British crown-colony in West Africa, comprising a part of the Guinea coast stretching inland to an average distance of 50 mi. The chief forts and settlements are, Cape Coast Castle, Elmina, Accra, Axim, Dixcove, and Annamaboe. The chief products are gold, palm oil, ivory, copal, caoutchouc, etc. Pop. 1,406,450.

Golden Age, that early mythological period in the history of almost all races, fabled to have been one of primeval innocence and enjoyment, in which the earth was common property, and brought forth spontaneously all things necessary for happy existence, while beasts of prey lived at peace with other animals. The Romans referred this time to the reign of Saturn. The so-called "golden age" of Roman literature is reckoned from the time of Livius Andronicus, 150 B.C., to the death of Augustus Cæsar, A.D. 14.

Golden Beetle, the popular name of several tetramerous beetles. Their most obvious characteristic is the great brilliancy of their color. There are none of large size. Among species found in the U. S. is the ladder beetle.

Golden Fleece, in classical mythology, the fleece of gold in quest of which Jason made the Argonautic expedition to Colchis. The fleece was suspended in an oak tree in the grove of Ares (Mars), and was guarded by a dragon. When the Argonauts came to Colchis for the fleece, Medea put the dragon to sleep and Jason carried the fleece away.

Golden-rod is a genus of plants, natural order Compositæ, chiefly natives of North America, where are found more than one hundred species. Some are found in old-fashioned borders but are so coarse and weedy as hardly to merit a place beyond the shady corner of the roughest shrubbery. The leaves of this plant have been used for tea. Most of the species have erect, rod-like, scarcely branched stems, with alternate serrated leaves, and terminal spikes or racemes of small, yellow flowers.

Golden-rod.

Goldfish, the trivial name of a beautiful species of carp, found in the fresh waters of China. It is greenish in color in the natural state, the golden yellow color being found only in domesticated specimens, and retained by artificial selection. These fishes are reared by the Chinese in small ponds, in basins, or porcelain vessels, and kept for ornament. By careful selection, many strange varieties and monstrosities have been propagated. They are now distributed over nearly all the civilized parts of the world, but in large ponds they readily revert to the color of the original stock.

Gold Lace, a fabric woven of silken threads which are either themselves gilt or are covered with fine gilt silver wire. In the former the gold leaf is fixed directly on the threads by means of gum. In the latter and finer kind, the fine gilt silver wire is twisted compactly round the silk threads, which are then ready for being manufactured into lace.

Goldo'ni, Carlo (1707–1793), a celebrated Italian writer of comedies, b. at Venice. After his father's death he settled as an advocate in Venice, but shortly took to a wandering life with strolling players, until, in 1736 he married the daughter of a notary and settled down in Venice. Here he first began to cultivate that department of dramatic poetry in which he was to excel; namely, the description of character and manners. In this he took Molière, whom he began to study about this time, for his model. For five years he visited

various cities of Italy, composing pieces for different theatrical companies, and for a time renewing his legal practice. Many of his pieces still appear on the stage.

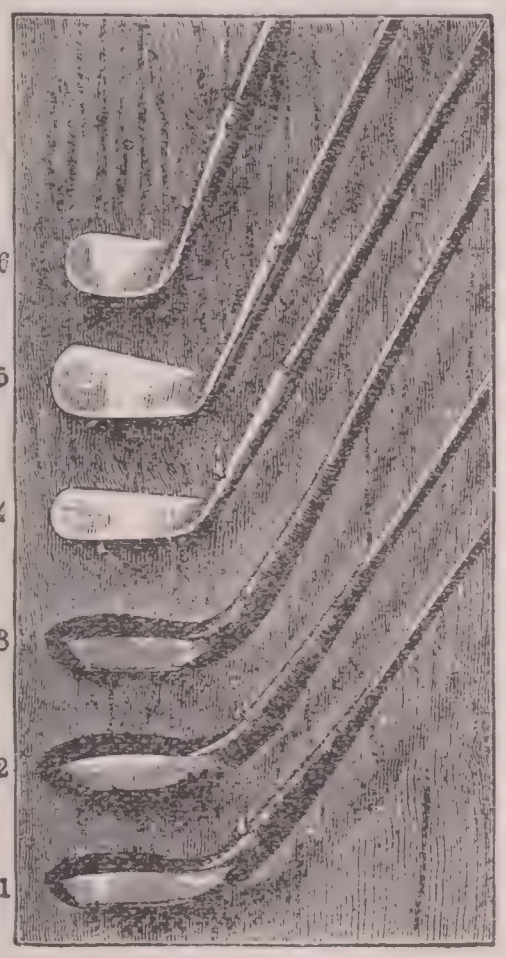
Goldsboro, Wayne co., N. C., on Neuse River, 48 mi. e. of Raleigh. Railroads: Atlantic Coast Line, Southern Ry. terminus, Mid. N. C. Ry. terminus, and A. & N. C. terminus. Industries: lumber co., two iron foundries, brick, ice, chair, tobacco, cotton-seed oil, cotton, and other factories. The town was first settled in 1847 by Colonel Goldsborough, and became a city in 1872. Pop. 1900, 5,877. It is situated directly in the path of the gulf winds, 80 mi. from the Atlantic.

Goldschmidt (golt'shmit), Meier Aaron (1819–1887), Danish novelist. In 1840 he founded what became the most famous of Danish newspapers, *The Corsair*, celebrated for its brilliant wit and audacious satire. His novel, *A Jew*, was translated into English and several other European languages.

Goldsmith, Oliver (1728–1774), poet and miscellaneous writer, b. at Pallas, county Longford, Ireland. His father, a clergyman of the Established Church, held the living of Kilkenny West. In 1745 he was entered as a sizar at Trinity College, Dublin. In 1749, shortly after his father's death, he quitted Dublin with the degree of Bachelor, and was advised by an uncle, who had already borne a large part of the expenses of his education, to prepare for holy orders. Rejected for holy orders he became tutor in a family, but soon lost his situation on account of a dispute with the master of the house over a game of cards. He then went to Edinburgh to study medicine. Here he remained eighteen months, during which he acquired some slight knowledge of chemistry and natural history. At the end of this period he removed to Leyden, and afterward wandered over a large part of France, Germany, Switzerland, and Italy. It was probably at Padua that he took a medical degree, as he remained there six months; but his uncle dying while he was in Italy, he was obliged to travel on foot to England, and reached London in 1756 with a few pence in his pocket. After some years of hard experience as a chemist's assistant, medical practitioner, proofreader, and school usher, he drifted into literature. He conducted a department in the *Monthly Review*, wrote essays in the *Public Ledger*, and a weekly pamphlet, entitled the *Bee*. In 1761 he was introduced to Doctor Johnson. In 1764 he appeared as a poet by the publication of his *Traveler*. In 1766 appeared his *Vicar of Wakefield*, which at once secured merited applause. In 1768 his comedy of the *Good-natured Man* was acted at Covent Garden with but indifferent success. His poetical fame was greatly enhanced by the publication of his *Deserted Village* in 1770. In 1773 he produced his comedy of *She Stoops to Conquer*, which was completely successful. He also compiled histories of England, Greece, and Rome; and a *History of the Earth and Animated Nature*, a pleasing work, but one of no scientific value. His last days were embittered by the pressure of debt,

incurred partly by his improvidence and partly by his generosity. The manners of Goldsmith were eccentric, even to absurdity. As a poet, his *Traveler* and *Deserted Village* have given him a deserved reputation; and his *Vicar of Wakefield* is one of the best-known and most delightful of English novels.

Golf, a game played with clubs and balls, generally over large commons, downs, or links, where a series of small round holes are cut in the turf at distances of from 100 to 500 yds. from each other, according to the nature of the ground, so as to form a circuit or round. The clubs are of different uses, and have different names according to the purpose for which they are respectively designed; as the *driver*, *putter*, *spoon*, *sand-iron*, *cleek*, and *niblick*, or *track-iron*. The rival players are one on each side, or two against two, in which case the two partners strike the ball on their side alternately. The object of the game is, starting from the first hole, to drive the ball into the next hole with as few strokes as possible, and so on with all the holes in succession, the side which holds its ball on any occasion with the fewest strokes being said to gain the hole. The match is usually decided by the greatest number of holes gained in one or more rounds, or the aggregate number of strokes taken to "hole" one or more rounds. Golf, which for a long time was a game almost entirely confined to Scotland, is now established s. of the Tweed and in many of the British colonies.



Club Head;
1.— driver; 2.— mid-spoon; 3.— putter; 4.—cleek; 5.—iron; 6. —niblick.

Goli'ath, a giant of Gath slain by David. His height was "six cubits and a span," which, taking the cubit at 21 in., would make him a little over 11 ft. The Septuagint and Josephus read, "*four* cubits and a span."

Golosh'es, a word introduced into our language from the French *galoche*, but originally derived from the Spanish *galocha*, meaning a wooden shoe or clog. It was formerly applied by the English to a kind of wooden clogs. The name is restricted to overshoes, now generally made of vulcanized india rubber.

Gome'ra, one of the Canary Islands, about 12 mi. by 9 in extent; pop. 11,989. It has two towns, St. Sebastian and Villa Hermosa.

Gonaives, a town on the west coast of Hayti, on the bay of the same name, 65 mi. n.n.w. of Port au Prince. It has an excellent harbor. The exports are cotton, coffee, salt, and mahogany. Pop. 3,000.

Gonda, chief town of district of the same name, Oudh, India, 28 mi. n.n.w. of Fyzábád. Pop. 13,743. The district has an area of 2,881 sq. mi.; pop. 1,270,926.

Gon'dola, a sort of barge, curiously ornamented, and navigated on the canals of Venice. The middle sized gondolas are upward of 30 ft. long and 4 broad; they always terminate at each end in a very sharp point, which is raised perpendicularly to the height of a man. Toward the center there is a curtained chamber for passengers.

Gonds, the aboriginal or rather non-Aryan inhabitants of the old territorial division of Hindustan called Gondwana, corresponding pretty nearly to what is now called the Central Provinces. After a long period of repression, they attained to a position of great prominence and power, and in the sixteenth, seventeenth, and eighteenth centuries three Gond dynasties simultaneouly held almost the whole of Gondwana under their sway. With the rise of the Mahrattas the power of the Gonds declined, and in 1781 the last of their dynasties was overthrown and the independence of the Gonds ceased. Their numbers have been variously estimated up to 2,000,000.

Gong, a Chinese musical instrument made of an alloy of copper, (about twenty-eight parts) and tin (about twenty-two parts), in form like a round flat dish with a rim 2 to 3 in. in depth. It is struck by a kind of drumstick, the head of which is covered with leather, and is used for of making loud sonorous signals, of marking time, and of adding to the clangor of martial instruments.

Goniometer, an instrument for measuring solid angles, particularly the angles formed by the faces of crystals. The *reflecting goniometer* is an instrument of this kind for measuring the angles of crystals by determining through what angular space the crystal must be turned so that two rays reflected from two surfaces successively shall have the same direction.

Gonsal'vo, Hernandez y Aguilar, de Cordova (1453–1515), Spanish soldier called the Great Captain, was b. at Montilla, near Cordova. He distinguished himself in the Portuguese War which began in 1475, and in the great war with the Moors, which ended with the conquest of Granada in 1492. In 1495 he was sent to assist Ferdinand II, king of Naples, against the French. In less than a year Gonsalvo drove the French over the Neapolitan frontiers, and returned to Spain, where he was engaged in subjecting the Moors in the Alpujarras, when Louis XII of France renewed the war against Naples. Gonsalvo again took the field, and by the victory near Seminara in 1502 obtained possession of Calabrias. He was viceroy in Italy until 1507, when, through the jealousy of the king, and the calumnies of the courtiers, he was deprived of his office, and retired to Granada, where he died.

Gonzaga Family, a famous Italian family who ruled over Mantua for over three centuries. Many illustrious soldiers, statesmen, churchmen, and promoters and cultivators of arts, science, and literature sprang from this stock. They became extinct in 1708.

Goodall, Frederick, R. A., English painter, son of Edward Goodall, the engraver; b. in London 1822. At seventeen years of age he began to exhibit, and he has produced pictures very varied in subject and generally of high excellence.

Good Friday, a fast of the Christian church in memory of the crucifixion of Jesus, kept on the Friday of Passion Week, that is the Friday before Easter. It has been celebrated from a very early period. In the Roman Catholic Church the celebration of this fast includes prayers for all classes of people, including heretics, schismatics, pagans, and Jews, and the "Adoration of the Cross," but no mass is celebrated. In all Protestant churches the day is observed with much solemnity, except among Presbyterians. The practise of eating "cross-buns" on this day has now no religious significance.

Goodrich, Samuel Griswold (1793–1860), author, b. at Ridgefield, Conn. He was a publisher in Hartford and afterward in Boston. He is best known as "Peter Parley," a pseudonym which he assumed in writing, editing, and compiling upward of 170 children's books. In 1851 he acted as American consul at Paris, and published there in French a treatise on American geography and history. He also wrote *Recollections of a Lifetime; Sketches from a Student's Window; A History of All Nations; The Outcast, and Other Poems;* and a general natural history. His brother, Charles Augustus (1790–1862), was associated with him on some of the books published by him, and also wrote a history of the U. S. and other works.

Goods and Chattels, the legal and popular denomination for personal property as distinguished from things real, or lands, tenements, or hereditaments.

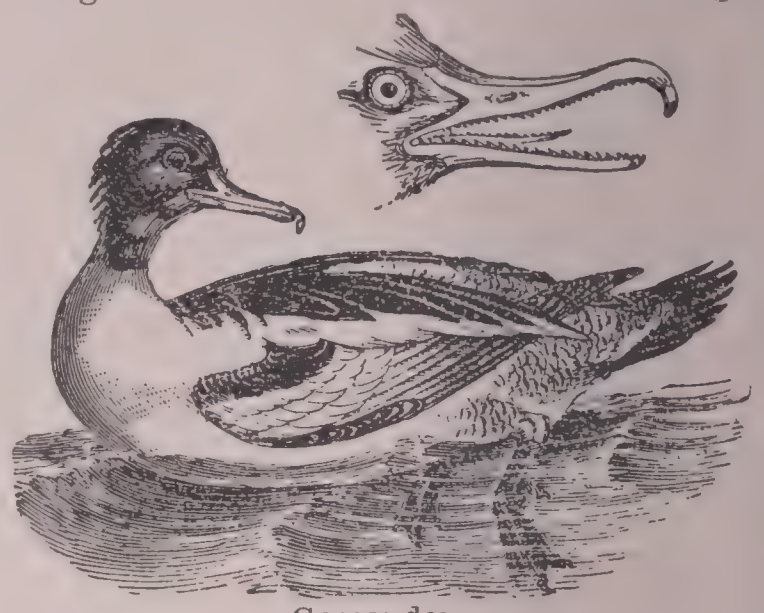
Good Templars, a temperance brotherhood which combines the principles of teetotalism with certain mystic rites, having secret signs, passwords, and insignia peculiar to itself. It originated in New York in 1851. The organization consists of local "subordinate" lodges, county "district" lodges, national "grand" lodges, and an international "right worthy" grand lodge. A "juvenile order" is also attached.

Good-will, the benefit derived from a business beyond the mere value of the capital, stock, funds, or property employed in it, in consequence of the general public patronage and encouragement which it receives from constant and habitual customers. It is legally considered a subject of sale along with the stock, premises, fixtures, trade debts, etc.

Goodyear, Charles (1800–1860), inventor, was b. in New Haven, Conn. In 1834 he experimented with india rubber, to form from it a solid, elastic material, and in 1835 obtained his first patent. Grand medals of the world's

fairs at London (1851) and Paris (1855) were conferred on him; also the Cross of the Legion of Honor. He d. in poor circumstances.

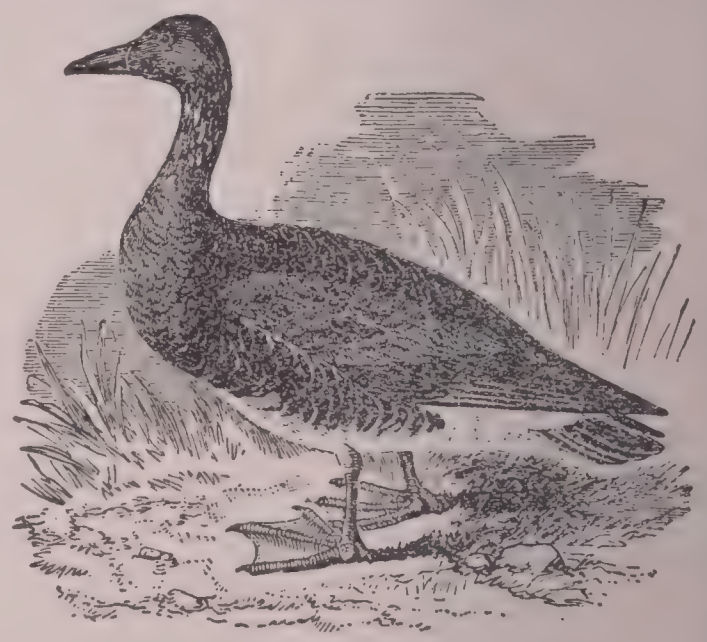
Goosander, a genus of migratory natatorial birds, characterized by a beak thinner and more cylindrical than that of the ducks, and having each mandible armed at its margins



Goosander.

with small pointed teeth, directed backward like a saw, the upper mandible being curved down at its extremity. The hooded goosander peculiar to North America belongs to this genus.

Goose, the common name of the birds belonging to the family Anseridæ or Anseres of earlier authors, a well-known family of natatorial birds. The domestic goose lives chiefly on land and feeds on grass; there are many varieties, but they do not differ widely from each other. It is valued for the table, and on account of its quills and fine soft feathers. The common wild goose, or graylag, which is



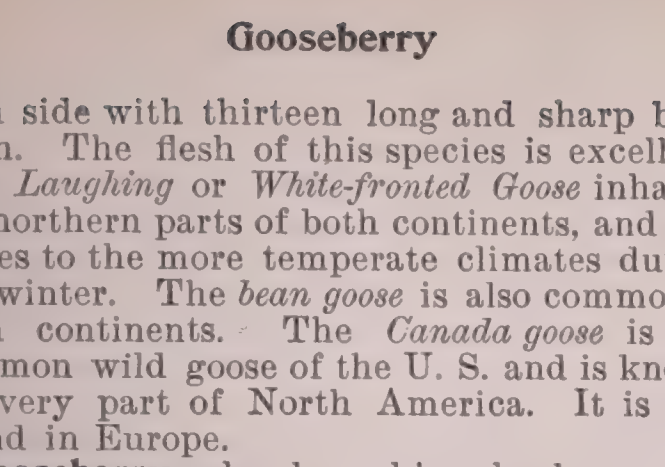
Bean Goose.

migratory, is the *Anser ferus,* and is believed to be the original of the domestic goose. The snow goose of North America is 2 ft. 8 in. in length, and its wings are 5 ft. in extent. The bill of this bird is very curious, the edges having each twenty-three indentations or strong teeth on each side. The inside or concavity of the upper mandible has also seven rows of strong, projecting teeth, and the tongue, which is horny at its extremity, is armed on

each side with thirteen long and sharp bony teeth. The flesh of this species is excellent. The *Laughing* or *White-fronted Goose* inhabits the northern parts of both continents, and migrates to the more temperate climates during the winter. The *bean goose* is also common to both continents. The *Canada goose* is the common wild goose of the U. S. and is known in every part of North America. It is also found in Europe.

Gooseberry, a low branching shrub, growing wild in Siberia, the north of Europe, and North America. The branches are armed with numerous prickles, and bear three to five lobed leaves and inconspicuous flowers. The fruit is a succulent berry, very wholesome and agreeable, of various colors—whitish, yellow, green, and red. Gooseberries are popular fruits for preserving, and are extensively cultivated, being of very easy culture. They may be raised from slips, which is the usual mode of perpetuating varieties; new varieties are raised from seed. The plant of four years old produces the largest and finest fruit; afterward the fruit becomes smaller but increases in quantity.

Gooseberry Caterpillar, a name applied to the larvæ of two very different insects, both injurious to gooseberry and currant bushes. 1, The Magpie Moth, appearing about midsummer, has usually a black head, yellow body, and white wings spotted with black. From eggs laid on the leaves of the above mentioned bushes, caterpillars hatch in September, feed



Gooseberry Caterpillar.

for a brief space, and then hide themselves till May or June of the next year. The caterpillar is a "looper," drawing itself up into a peculiar curve when alarmed, and has a black head, creamy body with some stripes of reddish-orange along the side and elsewhere, and with a row of black spots along the middle line of the back. After a period of voracity, it spins a transparent cocoon and passes into a chrysalis. Care of the bushes, syringing with various washes, and gathering the torpid caterpillars are the usual means of prevention and remedy. 2, More destructive than the above is the larva of the Gooseberry Sawfly, which plays havoc with the leaves of our bushes. The female sawfly appears about April and lays her eggs on the leaves. The grubs hatch in a week or less, and eat small round holes first in the leaf on which they are born, then all over the bush. The adult fly is a yellowish insect with transparent wings, and a third of an inch long.

Goosefoot is a genus of plants, natural order Chenopodiaceæ, indigenous to the temperate parts of the Eastern continent. They are weedy plants common in waste places, and bear small greenish flowers, which are sessile in small clusters, collected in spiked panicles. The oak of Jerusalem is found in sandy fields from New England to Illinois.

Gopher, the name of various burrowing animals, natives of North America. The pouched rat has large cheek pouches extending from the mouth to the shoulders, incisors protruding beyond the lips, and broad, mole like fore feet. Several burrowing squirrels also get this name.

Gorakhpur, a town of Hindustan, Northwest Provinces, division of Benares, capital of the district of same name, on the left bank of the Rapti. It has a considerable trade in grain and timber, sent down the Rapti to the Gogra and the Ganges. Pop. 57,922. The district has an area of 4,598 sq. mi. It is generally flat, and traversed by numerous streams, of which the principal are the Rapti and larger Gandak. Pop. 2,617,120.

Gordia'nus, M. Antonius, the name of three Roman emperors, father, son, and grandson. The first was b. in 158 A. D., and had governed Africa for many years, when he was proclaimed emperor at the age of eighty. He associated his son with him in the empire, but six weeks later the son was killed in fighting against the rival emperor Maximinus, and the father in an agony of grief, died by his own hand. The grandson was proclaimed emperor by the soldiers in Rome 238 A. D., although he was not more than fifteen years of age.

Gordon, Family of, a celebrated Scottish historical house, the origin of which is wrapped in obscurity. It is probable that the family came over to England with William the Conqueror, and at a subsequent period settled in Berwickshire, where a parish and village bear this name.

Gordon, Charles George (1833–1885), British soldier, known also as "Chinese Gordon" and Gordon Pasha; was b. at Woolwich. From 1874 to 1879 he was governor of the Soudan under the khedive. For a few months in 1882 he held an appointment at the Cape, and he had just accepted a mission to the Congo from the king of the Belgians, when he was sent to withdraw the garrisons shut up in the Soudan by the insurgent Mahdi. He was shut up in Khartoum by the rebels, and gallantly held that town for a year. A British expeditionary force under Lord Wolseley was dispatched for his relief, an advance corps of which sighted Khartoum on Jan. 24, 1885, to find that the town had been treacherously betrayed into the hands of the Mahdi two days before, and Gordon murdered.

Gordon, Patrick (1635–1699), a Scottish soldier. In 1661 he entered the Russian service, became a general, and rose high in favor with Peter the Great.

Gore, Catharine Grace (1799–1861), English novelist. In 1823 she was married to Charles Arthur Gore and shortly afterward

appeared her first novel, *Theresa Marchmont; or the Maid of Honor*. She wrote altogether from sixty to seventy novels, clever pictures of fashionable life.

Goree′, a small island, or rather rock, belonging to France, on the coast of Africa, a little more than a mile from the southern shore of the promontory that forms Cape Verd. The town of Goree contains about 2,000 inhabitants, and is an entrepôt of French trade.

Gorgons, in Greek mythology, three frightful goddesses whose names were Stheno, Euryăle, and Medusa. They were all immortal, except Medusa. Their hair was said to be entwined with serpents, their hands were of brass, their body was covered with impenetrable scales, their brazen teeth were as long as the tusks of a wild boar, and they turned to stone all those who looked upon them.

Goril′la, the largest animal of the ape kind. It attains a height of about 5½ ft., is found chiefly in the woody equatorial regions of the African continent, is possessed of great strength,

Gorilla.

has a barking voice, rising when the animal is enraged, to a terrific roar, lives mostly on trees, and feeds chiefly on vegetable substances, as the fruit and cabbage of the palm tree, the fruit of the ginger-bread tree, the papaw, the banana, etc. The erect position is more readily assumed than in most other anthropoid apes, owing to the shape of the sole of the foot which is not inverted, and is shorter and broader; but their ordinary gait is on all-fours. It has a ferocious and brutal cast of features, due to extremely prominent supra-orbital ridges and retreating forehead. Gorillas make a sleeping place like a hammock, connecting the branches of the sheltered and thickly-leaved part of a tree by means of the long, tough, slender stems of parasitic plants, and lining it with the broad, dried fronds of palms, or with long grass. This hammock-like abode is constructed at different heights, from 10 to 40 ft. from the ground, but there is never more than one such nest in a tree. The gorilla has 13 ribs, and in the proportion of its molar teeth to the incisors and in the form of its pelvis it approaches closely the human form. The Phœnician navigator Hanno found the name in use in the fifth century B. C. in West Africa.

Görlitz (geur′lits), a town in the Prussian government of Liegnitz, province of Silesia, on the left bank of the Neisse. It is well built, having generally substantial houses, several large squares and spacious streets. Its industries include woolens, linens, and cottons, machinery, etc. Pop. 55,702.

Gorman, ARTHUR P., ex-senator, was b. in Howard co., Md., March 11, 1839. He started in life as a page in the Senate. He served in the Maryland legislature from 1867 to 1880 when he was elected to the U. S. Senate. He was reëlected in 1886 and 1892, retiring to private life in 1898 at the end of his third term.

Gortschakoff, PRINCE MICHAEL, Russian general (1792–1861). He took part as an artillery officer in the battle of Borodino in 1812, and served in subsequent campaigns of the allies against the French. He took a prominent part in the Turkish war (1828–29); the Polish war (1831); the invasion of Hungary (1849); and in the war with Turkey and the western powers (1853–55). In the Crimea he held the command in Sebastopol during the siege. After the war he was made governor of Poland.

Görz (Göritz) (geurts, geu′rits), a town of Austria, province of Görz and Gradisca, near the head of the Adriatic, 23 mi. n.n.w. of Trieste. It occupies a very picturesque site on a mountain slope, and consists of the high town, surrounded by walls, and defended by an old castle; the new town, situated in the plain on the left bank of the river Isonzo; and several suburbs. Görz manufactures silk, cotton, leather, earthenware, etc. Pop. 20,433.

Goschen (gō′shen) (1831–), GEORGE JOACHIM, politician and financier, of German extraction, b. in London. He entered Parliament in 1863. In 1868 he became president of the poor law board, and subsequently first lord of the admiralty. On several occasions he found himself unable to move with the Liberal party; and when in 1886 Mr. Gladstone launched his Home Rule scheme for Ireland, Goschen became one of the leaders of the dissentient Liberals who formed the Liberal-Unionist party. Some time after, with the consent of his fellow Unionists, he accepted the office of chancellor of the exchequer in Lord Salisbury's government. He is the author of several financial and political pamphlets, and of a well-known work on the *Theory of Foreign Exchanges*.

Goshawk, a raptorial bird of the hawk kind, belonging to the genus *Astur*. The general color of the plumage is a deep brown, the breast and belly white. A full-grown female is 23 or 24 in. in length, the male a good deal smaller. TheAmerican Goshawk is the only species found in the U. S. The female

is 2 ft. long, extent of wings 4 ft., and weight about 3 lbs. The European species resembles the American. This bird flies low, and pursues its prey in a line after it, or in the manner called "raking" by falconers.

Goshawk.

Goshen, Elkhart co., Ind. R. R'ds: L. S. & M. S., and C. C. C. &. St. L. It is the center of a fertile farming region. Industries: iron works, flour, saw, and woolen mills, pump, brush, furniture, and sash factories. Pop. 1900, 7,810.

Gos'samer is the name of a fine, filmy substance, like cobweb, which is seen to float in the air in clear days in autumn, and is most observable in stubble fields, and upon furze, and other low bushes. This is formed by several kinds of small spiders, and only, according to some, when they are young.

Gosse, PHILIP HENRY, F. R. S. (1810–1888), naturalist, b. at Worcester. From 1827 to 1835 he was resident in Newfoundland, and afterward traveled through Canada and the U. S., making all the time large collections of insects, etc. In 1844 he visited Jamaica. Among his many works are: *The Canadian Naturalist, The Birds of Jamaica, A Naturalist's Sojourn in Jamaica, The Aquarium, Marine Zoology, Life, Actinologia Britannica, Romance of Natural History,* etc., besides many contributions to the learned societies.

Gotha (gō' tȧ) a town of Germany, capital of the duchy of Saxe-Coburg-Gotha, on the Leine, 14 mi. w. s. w. Erfurt. It contains a museum, a picture gallery, a valuable cabinet of engravings, a library of 200,000 vols., and a collection of over 80,000 coins and medals. The manufactures consist chiefly of woolen, linen, and cotton tissues, porcelain, musical instruments, and articles in gold and silver. Pop. 27,802.

Gotham, a name given by Washington Irving to New York. See *New York.*

Gothard, ST., a mountain group, Switzerland, on the confines of the cantons Tessin and Uri, belonging to the Lepontine or Helvetian Alps, which it connects with the Bernese Alps. It forms a kind of central nucleus in the great water shed of Europe. Its culminating point has a height of 10,600 ft. The col of St. Gothard, at its summit level, where the hospice stands, is 6,808 ft. high. Over it an excellent carriage road was completed in 1832. A railway tunnel has been pierced through this mountain group between Göschenen on the n. and Ariolo on the s., thus directly connecting the railway system of North Italy with those of Switzerland and Western and Central Germany. This tunnel is the longest in the world, being of the total length of 16,295 yds., or rather more than 9¼ mi. Its construction, begun in 1872, was completed in 1881, and it was opened for traffic early in 1882. Its total cost was about $12,000,000.

Gothic Architecture, a term applied to the various styles of pointed architecture prevalent in Western Europe, from the middle of the twelfth century to the revival of classic architecture in the sixteenth. The term was originally applied in a depreciatory sense to all the styles which were introduced by the barbarians who overthrew the Roman Empire. But the invention or introduction of the pointed arch gave birth to a new style of architecture, to which the name Gothic is now properly restricted. The chief characteristics of Gothic architecture are: the predominance of the pointed arch, and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines; the absence of the column and entablature of classic architecture, of square edges, and rectangular surfaces, and the substitution of clustered shafts, contrasted surfaces, and members multiplied in rich variety. This style originated in France, and spread very rapidly to England, Germany, Italy, Spain, and the Scandinavian countries. The several periods of Gothic architecture are clearly marked by the form and general treatment of the windows. Those of the Early English being of a simple lancet form of elongated proportions, or of two or more lancet forms combined by moldings. Those of the Decorated are broader in proportion, and with the upper part highly enriched with tracery of various curves and combinations. Those of the Perpendicular are frequently of very large size, and still broader in proportion, while the upper part is also highly enriched.

Goths, an ancient Teutonic tribe occupying when first known to history the region adjacent to the Black Sea n. of the lower Danube. About the middle of the third century these began to encroach on the Roman Empire. Having seized the Roman province of Dacia, they were assailed by Decius, whom they twice defeated. In 253 they captured Trebizond, where a large fleet of ships fell into their hands. With this force they sailed down the Ægean and plundered the coasts of Greece and Illyria. They now began to threaten Italy, but in 269 they were defeated with great slaughter by the Emperor Claudius. His successor Aurelian was, notwithstanding, compelled to cede to them the large province of Dacia, after which there was comparative peace between them for many years. In the fourth century the great Gothic kingdom extended from the Don to the Theiss, and from the Black Sea to the Vistula and the Baltic. About the year 369 internal commotions produced the division of the Gothic kingdom into

the kingdom of the Ostrogoths (eastern Goths) and the kingdom of the Visigoths (western Goths). In 396 Alaric, king of the Visigoths, made an irruption into Greece, laid waste the Peloponnesus, and became prefect of Illyria. He invaded Italy and sacked Rome in 409, and a second time in 410. After his death (in 410) the Visigoths succeeded in establishing a new kingdom in the southern parts of Gaul and Spain, of which, toward the end of the fifth century, Provence, Languedoc, and Catalonia were the principal provinces, and Toulouse the seat of government. The last king, Roderick, d. in 711 in battle against the Moors, who had crossed from Africa, and subsequently conquered the Gothic kingdom. After the fall of the Western Roman Empire, by the invasion of Odoacer in 476 the Eastern emperor Zeno, persuaded Theodoric, king of the Ostrogoths, to invade Italy in 489. The Goth became king of Italy in 493, and laid the foundation of a new Ostrogothic kingdom, which, together with Italy, comprised Rhætia (a part of Switzerland and the Tyrol), Vindelicia (part of Bavaria and Swabia), Noricum (Saltzburg, Stiria, Carinthia, Austria), Dalmatia, Pannonia (Farther Hungary, Slavonia), and Dacia beyond the Danube (Transylvania, Wallachia). This kingdom came to an end in 554. Subsequently the Goths both here and in Spain entirely disappeared as a distinct people.

Gottenburg (or Gothenburg; Swedish, *Göteborg*), a seaport town in Sweden, the second in respect of population and trade, capital of the län of the same name, situated at the mouth of the Göta, in the Kattegat, 255 mi. w.s.w. Stockholm, intersected by canals. It is one of the best built towns in Sweden, and the seat of a bishopric. It has manufactures of sail cloth, cotton, and other goods, and possesses shipbuilding yards, and tobacco factories, breweries, sugar refineries, etc. The trade is very extensive, the harbor being excellent and always free from ice. Among social reforms the town is noted for its licensing system, under which the public house licenses are granted to a company, which, after paying the expenses of management with six per cent. annual interest on the shareholders' capital, makes over the profits to the town treasury. This plan has been in force since 1865. Pop. 106,518.

Göttingen (geut'ing-en), a town of Prussia, province of Hanover, on the Leine, 59 mi. s.s.e. Hanover. It is a place of great antiquity. Its chief attraction is the university, founded in 1734 by George II of England and elector of Hanover, opened in 1737, and which has a European reputation. It has an average attendance of over 1,000 students. Connected with the university are a museum, an observatory, an anatomical theater, botanical garden, and a library possessed of 500,000 printed volumes and 5,000 MSS. The manufactures comprise woolens, chemicals, scientific instruments, etc. Pop. 21,561.

Gottland (or Gothland), an island of the Baltic, belonging to and 55 mi. e. of the coast of Sweden. It is of irregular shape, and has

an area of 1,200 sq. mi. The coast is for the most part rocky and deeply indented. The interior consists of a limestone plateau, intersected near its center by a range of heights from 200 to 300 ft. above the sea. The soil is fertile. The chief town, Wisby, was once a flourishing member of the Hanseatic League. Pop. 51,570.

Gottschalk, Louis Moreau (1820–1869), musician, was b. in New Orleans, La., in 1829. His marked musical ability induced his father to send him to Paris to receive further education. In 1848 his series of public concerts in Paris met with much success. He afterward appeared in the U. S., and in Mexico and South America.

Gough, John Bartholomew (1817–1886), temperance orator, b. at Sandhurst, Kent. He attained a great celebrity as an orator in America, Britain, and the colonies, and published his autobiography, orations, and a volume of sketches, *Sunlight and Shadow.*

Gould, Jay (1836–1892), b. at Roxbury, N. Y. He began active life as a surveyor, and in 1856 he entered the tanning and lumber business. Later he bought railroad bonds, and in 1859 established himself as a broker in New York City. He became president of the Erie Railway Co., and did an extensive business in railroad bonds. At one time he is said to have controlled over 12,000 mi. of railway, and to have been worth $70,000,000 at the time of his death.

Gounod (gö-nō), Charles François (1817–1893), French operatic composer, b. at Paris; studied at the Conservatoire under Halévy, Lesueur, and Pauer, and afterward in Italy. His first important work was *Faust* (1859), which raised him to a high rank among composers. Other operas followed among which are *Mireille* (1864), *Romeo et Juliette, Cinq Mars* (1877,) and *Polyeucte* (1878). He has written also a *Messe Solennelle, a motet Gallia,* and other choral works and songs. His oratorios *Redemption* (1882), *Mors et Vita* (1885), and a *Mass for the Jeanne D'Arc* festival (1887), are his latest compositions.

Gourd (görd), the popular name for the species of *Cucurbita,* a genus of plants of the natural order Cucurbitaceæ. The same name

The Great Gourd Branch with Flower.

is given to the different kinds of fruit produced by the various plants of this genus. These are held in high estimation in hot countries; they attain a very large size, and most of them abound in wholesome, nutritious matter. To the gourd family belong the squash, pumpkin, cucumber, watermelon, muskmelon, and several other species either cultivated or known as weeds. The *Lagenaria vulgăris*, or bottle gourd, a native both of the East and West Indies, is edible, and is often 6 ft. long and 18 in. in circumference. The outer coat or rind serves for bottles and water-cups.

Gout, a form of arthritis, a constitutional disorder giving rise to paroxysms of acute pain with a specific form of inflammation, appearing after puberty chiefly in the male sex, and returning after intervals. It is very often preceded by, or alternates with, disorder of the digestive or other internal organs, and is generally characterized by affection of the first joint of the great toe, by nocturnal exacerbations and morning remissions and by vascular plethora; various joints, organs, or parts becoming affected after repeated attacks without passing into suppuration. It may be acquired or hereditary. In the former case it rarely appears before the age of thirty-five; in the latter it is frequently observed earlier. It appears that the disease is due to an excess of uric acid in the blood, this either being formed in the body in too large quantity, or not being removed from the blood by the kidneys in the urine as it ought to be. Indolence, inactivity, and too free use of tartareous wines, fermented liquors, and very high-seasoned and nitrogenous food, are the principal causes which give rise to this disease. Strict regulation of the habits of life is one of the most important elements in the treatment of gout.

Gov'an, a town of Scotland, county of Lanark, on the left bank of the Clyde, to the west of Glasgow, of which it forms a suburb. It is the site of extensive shipbuilding yards, engineering works, dye-works, etc. Pop. of town, 50,492.

Government is a word used in common speech in various significations. It denotes the act of governing, the persons who govern, and the mode or system according to which the sovereign powers of a nation, the legislative, executive, and judicial powers are vested and exercised. Aristotle classified the forms of government into three classes: 1, Monarchy, or that form in which the sovereignty of the state is vested in one individual; 2, Aristocracy, or that in which it is confided to a select portion of the community supposed to possess peculiar aptitude for its exercise; and 3, Democracy, or that in which it is retained by the community itself, and exercised, either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states of the modern times. Each of these forms if brought into existence by the general will of the community, maintained by its consent, and employed for its benefit, is said to be a legitimate government. But each of these legitimate forms was considered by the ancients to be liable to a particular form of corruption. Monarchy had a tendency to degenerate into tyranny, or a government for the special benefit of the single ruler; aristocracy became oligarchy; and democracy degenerated into ochlocracy or mob rule. Through each of these various forms, each legitimate form being followed by its corresponding perverted form, government was supposed to run in a perpetual cycle; the last form, ochlocracy, being followed by anarchy. As a means of avoiding these evils, a mixed government is supposed to have been devised. The best species of mixed government was believed by Aristotle to be a union of aristocracy and democracy.

Governor, a contrivance in mills and machinery for maintaining a uniform velocity with a varying resistance. A common form of steam engine governor consists of a pair of balls suspended from a vertical shaft kept in motion by the engine. When the engine goes too fast the balls fly farther asunder, and depress the end of a lever, which partly shuts a throttle valve, and diminishes the quantity of steam admitted into the cylinder; and on the other hand, when the engine goes too slow, the balls fall down toward the spindle and elevate the valve, thus increasing the quantity of steam admitted into the cylinder. By this ingenious contrivance, therefore, the quantity of steam admitted to the cylinder is exactly proportioned to the resistance of the engine, and the velocity kept constantly the same. A similar contrivance is employed in mills to equalize the motion of the machinery. When any part of the machinery is suddenly stopped, or suddenly set going, and the moving power remains the same, an alteration in the velocity of the mill will take place, and it will move faster or slower. The governor is used to remedy this.

Gower, JOHN (1320–1408), an early English poet, a contemporary and friend of Chaucer. His chief works are his *Speculum Meditantis*, *Vox Clamantis*, and *Confessio Amantis*, of which the first was a moral tract relative to the conjugal duties, written in French rhymes (now lost); the second a metrical chronicle of the insurrection of the commons under Richard II, in Latin elegaic verse; and the third an English poem in eight books, containing 30,000 lines, relative to the morals and metaphysics of love, one of the earliest products of the English press, being printed by Caxton in 1438.

Gowrie Conspiracy, one of the strangest episodes in Scottish history, took place in August, 1601. King James VI, while hunting in Falkland Park, Fifeshire, was asked by Alexander Ruthven (brother of the earl of Gowrie) to accompany him to Gowrie House, near Perth, on the pretext that they had caught a Jesuit with an urn of foreign golden pieces hid under his cloak. On arriving at Gowrie House an attempt was made on the life or liberty of the king, but an alarm being raised, both the Ruthvens were slain, and James with difficulty escaped, as the Gowries

were very popular with the inhabitants of Perth.

Gozo (or Gozzo), an island of the Mediterranean, belonging to Britain, about 4 mi. n.w. of Malta; length, 9 mi.; breadth, 5 mi.; area about 40 sq. mi. A good deal of grain and fruit is raised, but the most important crop is cotton. Cattle of superior quality are reared. The chief town, Rabato, contains about 2,000, and the whole island 17,882 inhabitants.

Gozzoli (got'so-lē), BENNOZO (1424–1496), Italian painter, b. at Florence. He was a pupil of Fra Angelico, and wrought at Florence, Rome, Orvieto, and Pisa. His name is specially identified with the great series of mural paintings in the Campo Santo, at Pisa, consisting of twenty-four subjects from the Old Testament, from the invention of wine by Noah to the visit of the Queen of Sheba to Solomon.

Gracchus, a Roman family of the Sempronian gens, several members of which have become historical. TIBERIUS SEMPRONIUS GRACCHUS, a general of the Second Punic War, was consul 215 B. C., defeated Hanno, 214 B. C., and was killed 212 B. C. Another TIBERIUS SEMPRONIUS GRACCHUS became consul 178 B. C., and again 163 B. C. He married Cornelia, a daughter of Scipio Africanus, and was the father of the two most celebrated Gracchi, TIBERIUS SEMPRONIUS and CAIUS, the former b. about 169 B. C., killed 133 B. C.; the latter b. 159 B. C., killed 121 B. C. The brothers having lost their father early, received from their mother Cornelia a careful education. At a more advanced age their minds were formed and ennobled by the Greek philosophy. In 133 B. C. Tiberius was a candidate for the tribuneship, which office rendered his person inviolable so long as he was invested with it, and placed him in a situation to advance his great plans for the improvement of the condition of the people in a legal way. His first efforts were directed to a reform of the Roman land system, by the restoration or enforcement of the old Licinian law, which enacted that no one should possess more than 500 acres of the public domains, and that the overplus should be equally divided among the plebeians. This law, which was now called, after Gracchus, the *Sempronian*, or, by way of eminence, the *agrarian law*, he revived, but with the introduction of several softening clauses. He was violently opposed by the aristocracy and the tribune Marcus Octavius, whose veto retarded the passage of the bill. Tiberius, however, by exerting all the prerogative of his office, managed to pass his bill. But fortune turned against him; he was accused of having violated his office; of aspiring to be king; and at the next election for the tribuneship he was slain, with 300 of his followers, at the entrance to the Temple of Fides. Ten years after the death of his brother, Tiberius, the younger Gracchus obtained the tribuneship. In the discharge of his office he first of all renewed his brother's law, and revenged his memory by expelling many of his most violent enemies from the city. Several popular measures gained him great favor with the people, but the intrigues of the nobles ultimately caused his fall.

Grace, DAYS OF, in commerce, a certain number of days immediately following the day, specified on the face of a bill or note, on which it becomes due. Till the expiry of these days payment is not necessary. In America and Great Britain, the days of grace are three. Austria (three days), and Russia (ten days) are the only other countries which allow days of grace.

Graces, the goddesses of grace, from whom, according to Pindar, comes everything beautiful and agreeable. According to most poets and mythologists they were three in number, the daughters of Zeus and Eurynome, and Hesiod gives them the names of *Aglaia* (brilliancy), *Thalia* (the blooming), and *Euphrosyne* (mirth). Homer mentions them in the *Iliad* as handmaids of Hera (Juno), but in the *Odyssey* as those of Aphrodītē (Venus), who is attended by them in the bath, etc. He conceived them as forming a numerous troop of goddesses, whose office it was to render happy the days of the immortals. The three graces are usually represented slightly draped or entirely nude, locked in each other's embrace, or hand in hand.

Gracio'sa, one of the Azores. Chief town, Santa Cruz. Pop. 8,000.

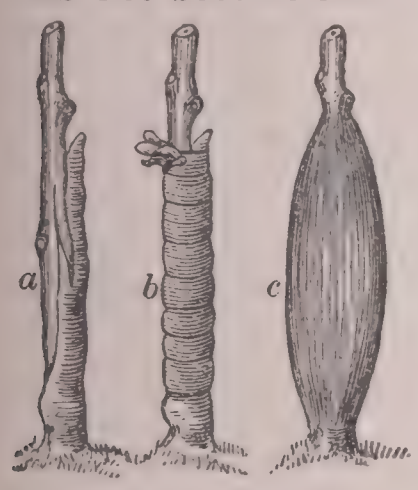
Gra'dient, in roads, and railways, and ditches, a term used to signify the departure of the track from a perfect level, usually expressed as a fraction of the length; thus 1 in 250 signifies a rise or fall of 1 ft. in 250 ft. measured along the line.

Graduation, the art of dividing into the necessary spaces the scale of mathematical, astronomical, and other philosophical instruments. Common graduation is simply effected by copying from a scale prepared by a higher process; original graduation is chiefly performed either by *stepping* or bisection. Stepping consists in ascertaining by repeated trial with finely-pointed spring-dividers—which are made, as it were, to proceed by successive steps—the size of the divisions required, their number being known, and then finally marking them. In bisection, the beam compasses are used, an arc with a radius of nearly half the line being described from either end of the line, and the short distance between the arcs bisected with the aid of a magnifier and a fine pointer. The process is repeated, for each of the two halves thus obtained, until by subdivision the required graduation is obtained. Ordinary instruments are graduated by machines, most of which are based upon the principle of that invented by Ramsden in 1766. In this there is a horizontal wheel, turning on a vertical axis, with a toothed edge which is advanced a certain amount (e. g. 10′ of arc) by each revolution of the endless screw with which it gears. The screw is worked by a treadle, and the machine can be so adjusted that a movement of the treadle shall secure either the whole or any desired part of a revolution of the screw. A dividing engine was invented by Troughton, but it was exceed-

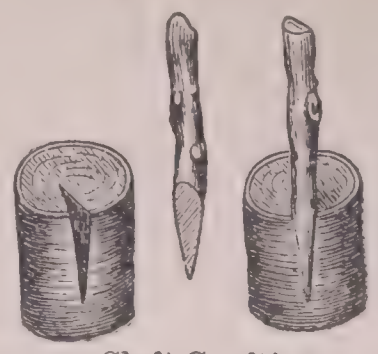
ingly complicated. That of Simms, which was self-acting and threw itself out of gear when its work was done, takes a high place among mechanical inventions. The most accurate was that of Andrew Ross (1831). For fine graduation Froment invented a machine in which the object to be graduated was slowly and intermittingly pushed forward by a screw, while a fine steel or diamond point, working automatically, made a cut at each cessation of the feeding motion. He thus drew 25,000 lines marking equal intervals in the space of one inch, but the number has since been increased to 225,000 by Nobert.

Grady, Henry W. (1851–1889), b. at Athens, Ga. He was educated at the University of Georgia and the University of Virginia. Later he was correspondent of the New York *Herald*, and editor of the Rome *Daily Commercial*, and later of the Atlanta *Herald*. In 1882 he became managing editor of the Atlanta *Constitution*. He was well known as a public speaker, his theme usually being the *New South*.

Grafting, an operation by which a bud or scion of an individual plant is inserted upon another individual, so as to become organically united with the stock on which it has been placed. Grafting can only take place between plants which have a certain affinity, individuals of the same species, genus, or order. The graft does not become identified with the stock to which it is united, but retains its own peculiarities of variety or species. The parts between which grafting is effected must be actively vegetating. The advantages derived from grafting are the preservation of remarkable varieties, which could not be reproduced from seed; the more rapid multiplication of particular species, and the anticipation of the period of fructification, which may thus be advanced by several years. The principal methods of grafting are: 1, *By approach*. This process is intended to unite at one or more points two plants growing from separate roots. Plates of bark of equal size are removed, the wounds are kept together and protected from air. Stems, branches, or roots may be united in this way. 2, *By scions*. Under this head there are a variety of methods, such as *whip*, *splice*, *cleft*, *saddle*, *crown grafting*, *etc.* In *whip grafting* or *tongue grafting* the stock is cut obliquely across and a slit or very narrow angular incision is made in its center downward across the cut surface, a similar deep incision is made in the scion upward, at a corresponding angle, and a projecting tongue left, which being inserted in the incision in the stock they are fastened closely together. *Splice grafting* is performed by cutting the ends of the scion and stock completely across in an oblique direction, in such a way that the sections are of the same shape, then laying the oblique surfaces together so that the one exactly fits the other, and securing them by tying or otherwise. In *cleft grafting*, the stock is cleft down, and the graft, cut in the shape of a wedge at its lower end, is inserted into the cleft; while in *saddle grafting* the end of the stock is cut into the form of a wedge, and the base of the scion, slit up or cleft for the purpose, is affixed. *Crown grafting* or *rind grafting* is performed by cutting the lower end of the scion in a sloping direction, while the head of the stock is cut over horizontally and a slit is made through the inner bark. A piece of wood, bone, ivory, or other substance, resembling the thinned end of the scion, is inserted in the top of the slit between the alburnum and inner bark, and pushed down in order to raise the bark, so that the thin end of the scion may be introduced without being bruised. The edges of the bark on each side are then brought close to the scion, and the whole is bound with matting, and a lump of clay put round it. 3, *By buds*. This consists in transferring to another stock a plate of bark, to which one or more buds adhere. Bud grafting is the most commonly practised, especially for multiplying fruit trees and roses, owing to the facility with which it may be performed.



a.—tongue grafting.
b.—tongue, with ligature applied.
c.—tongue, with clay applied.



Cleft Grafting.

Grafton, Augustus Henry, third duke of, (1735–1811), he was secretary of state under Rockingham, first lord of treasury under the elder Pitt, and premier during the illness of the latter (now Lord Chatham). He subsequently held the privy seal under Lord North, and again under Rockingham. He was the subject of some of the most brilliant of the letters of Junius.

Grafton, Taylor co., W. Va., on Tygart Valley River, 100 mi. s.e. of Wheeling. Railroad: B. & O. Industries: railroad shops, three flouring mills, iron foundry, pump factory, ice plant, and four planing mills. Plenty of coal and natural gas in vicinity. Surrounding country agricultural and mineral. The town was first settled about 1840 and West Grafton was annexed in 1897. Population in 1900, 5,650.

Graham, Thomas, D. C. L., F. R. S. (1805–1869), master of the mint, an eminent chemist, was b. at Glasgow and educated at Glasgow University. In 1831 he established the law that gases tend to diffuse inversely as the square root of their specific gravities. He afterward made a series of investigations into the constitutions of arseniates, phosphates, and phosphoreted hydrogen, and into the function of water in different salts. In 1841 he was chosen first president of the Chemical Society, which he had assisted in founding; in 1846 he assisted in founding the Cavendish Society, over which he presided. He distinguished

the crystalloids and colloids in liquid solutions, and gave to their separation the name of *dialysis*. In a subsequent paper, *Philosophical Transactions*, 1866, he applied these discoveries to gases, under the name *atmolysis*. The passage of gases through heated metal plates and the occlusion of gases were also ably investigated by him.

Graham Land, a tract of land in the Antarctic Ocean, discovered in 1832 by Biscoe, who took possession of it for Great Britain. It stretches between lat. 63° and 68° s., and lon. 61° and 68° w., and is supposed to be of great extent.

Grail (variously spelled *Greal, Graal, Grazal, Grasal*, etc.), the legendary holy vessel, supposed to have been of emerald, from which Christ dispensed the wine at the last supper. It was said to have been brought to England by Joseph of Arimathea, but to have been taken back to heaven until the appearance of heroes worthy to be its guardians. Titurel, a descendant of the Asiatic prince Perrillus, whose descendants had allied themselves with the family of a Breton sovereign, was chosen as its keeper. He erected for it a temple on the model of that at Jerusalem, and organized a band of guardians. It was visible only to the baptized and pure of heart. With this legend that of King Arthur became connected. Three of his knights, Galahad, Percival, and Bors, had sight of it, and on the death of Percival, its last guardian, it was again taken to heaven.

Grain includes all those kinds of grass which are cultivated on account of their seeds for the production of meal or flour. All kinds of grain contain in varying quantities the following elements: gluten, fecula or starch, a sweet mucilage, a digestible aromatic substance contained in the hulls, and moisture, which is predominant even in the driest grain, and serves, after planting, to stimulate the first motions of the germ.

Grains of Paradise (Guinea grains or Malaguetta pepper), the pungent somewhat aromatic seeds of *Amomum Meleguetta*, nat. order Zingiberaceæ, a plant of tropical Western Africa. They are chiefly used in cattle medicines and to give a fiery pungency to cordials. The "Grain Coast" of Africa takes its name from the production of these seeds in that region.

Grak'le, a genus of birds of the order Passeres, and of the starling family inhabiting India and New Guinea. One of the genus is the Indian mina bird, which can be taught amusing tricks and can imitate the human voice. It is of a deep velvet black, with a white spot on the wing, yellow bill and feet, and two yellow wattles on the back of the head. A considerable number of other birds not belonging to this genus have also been called grakles, such as the purple grakle, or crow blackbird of America.

Grallato'res, an order of birds which formerly included the heron, ibis, stork, but these are now put into another order, and the grallatores, properly so called, consist of the following families, namely, those of the snipe, stint, and ruff; the red-shanks, green-shanks,

and sand-pipers, the curlews, phalaropes, stilts, and avocets, the plovers, oyster-catchers, turnstones, lapwings, coursers, the jacanas, the bustards, the rails and coots, and the cranes. They are generally known as wading-birds, as they frequent shores and banks of streams, marshes, etc., and their legs and beak are commonly rather long.

Grammar, in reference to any language, is the system of rules, principles, and facts which must be known in order to speak and write the language correctly. *Comparative grammar* treats of the laws, customs, and forms which are shown by comparison to be common to various languages; *general* or *universal grammar*, of those laws which, by logical deduction, are demonstrated to be common to all. The divisions of Grammar vary with the class and also with the method of treatment. In common English grammars the division is generally fourfold: *orthography*, which treats of the proper spelling of words, and includes orthoepy, treating of the proper pronunciation; *etymology*, which treats of their derivations and inflections; *syntax*, of the laws and forms of construction common to compositions in prose and verse; *prosody*, of the laws peculiar to verse. Comparative grammar can only be said to have existed from the beginning of the present century, when the critical study of Sanskrit established the affinities of the languages of the Indo-European group. The names of Bopp, Grimm, Pott, Schleicher, Müller, etc., are especially associated with its development.

Gramme, the unit of weight in France =15.4323 grains. A decagramme or ten grammes=5.644 drams; a hectogramme (100 grammes)=3.527 oz.; a kilogramme (1,000 grammes)=2.205 lbs.; a myriagramme (10,000 grammes)=22.046 lbs.

Grampian Mountains, a range, or rather series of ranges and elevated masses, stretching across Scotland diagonally s.w. to n.e. for about 150 mi. It commences in Argyleshire, and at the boundaries of Perthshire and Aberdeenshire may be said to separate into two distinct branches—one on the n. side of the Dee, terminating near Huntly; the other running on the s. side of that river, and terminating near Stonehaven. With the exception of Ben Nevis, the Grampians comprise all the highest mountains in Scotland, Ben Cruachan, Ben Lomond, Ben Lawers Schiehallion, Ben Macdhui, 4,926 ft., Cairngorm, Cairntoul, etc. The more remarkable passes are those of Leney, Aberfoyle, Glenshee, and Killiecrankie.

Grampus, a name for several marine cetaceous mammals allied to the dolphins, especially *Orca Gladiator* of the Atlantic and North Sea, which grows to the length of 25 ft., and is remarkably thick in proportion to its length. The spout hole is on the top of the neck. The color of the back is black; the belly is of a snowy whiteness, and on each shoulder is a large, white spot. The grampus is carnivorous and remarkably voracious, even attacking the whale.

Granada (grå-nä'då), a city in the south of

Spain, capital of the province of Granada. The streets rise picturesquely above each other, with a number of turrets and gilded cupolas, the whole being crowned by the Alhambra, or palace of the ancient Moorish kings. In the background lies the Sierra de Nevada, covered with snow. The streets, however, are narrow and irregular, and the buildings inferior to those of many other towns in Spain.

Grampus.

The town is partly built on two adjacent hills, between which the Darro flows, traversing the town and falling into the Genil, which flows outside the walls. The cathedral is an irregular but splendid building, and the archbishop's palace and mansion of the captain general are also noteworthy; but the special features of the town are the Alhambra, and another Moorish palace called the *Generalife*, built on an opposite hill. The city was founded by the Moors before 800, and from 1036 to 1234 was included in the kingdom of Cordova. In 1235 it became the capital of the Moorish kingdom of Granada, and attained almost matchless splendor. In 1491 it remained the last stronghold of the Moors in Spain, but was taken by the Spaniards under Ferdinand and Isabella in 1492, along with the kingdom, having then a population of perhaps 500,000. Its prosperity continued almost without diminution till 1610, when the decree expelling the Moors from all parts of Spain told severely upon it, and it has never recovered. Pop. 67,395.

Granada, formerly a Moorish kingdom in Spain, bordering on the Mediterranean, now represented by the three provinces, Granada, Almeria, and Malaga; area 11,000 sq. mi. The olive and vine are extensively cultivated, and fruit is very abundant. The sugar cane thrives in some parts. After long forming part of the kingdom of Cordova, Granada became a separate kingdom in 1235. In 1492 it passed into the possession of the Spaniards.

Gran Chaco, El, a territory of the Argentine Republic, lying mainly between the Vermejo, Paraná, and Salado. In the west it is intersected by offsets of the Andes, and in the east forms extensive plains and marshes, while in the south are sandy deserts interspersed with salt pools. The greater part, however, is covered with primeval forest. It is inhabited by various Indian tribes, the total Indian population being estimated at from 20,000 to 40,000. The Central Chaco, recently explored with a view to colonization, seems well adapted for growing sugar cane, tobacco, maize, rice, etc., but not for cereals generally. The name is also applied to a much more extensive territory of similar character extending into Bolivia.

Grand-duke, the title of the sovereign of several of the states of Germany, who are considered to be a rank between duke and king; also applied to members of the imperial family of Russia.

Grandee′, in Spain a noble of the first rank, which consisted partly of the relatives of the royal house, and partly of such members of the high, feudal nobility distinguished for their wealth as had, by the grant of a banner received from the king, the right to enlist soldiers under their own colors. Besides the general prerogatives of the higher nobility, and the priority of claim to the highest offices of state, the grandees possessed the right of covering the head in the presence of the king, with his permission, on all public occasions. The king called each of them "my cousin" (*mi primo*), while he addressed the other members of the high nobility only as "my kinsman" (*mi pariente*). Under Ferdinand and Isabella and Charles V the independent feudal nobility because a dependent order of court nobles.

Grand Forks, Grand Forks co., N. D., on Red River, 320 mi. n.w. St. Paul. Railroads: Great Northern and Northern Pacific. Industries: woolen mills, four flouring mills, iron foundry, planing mills, sash, door, and blind, and farm implement factories. Surrounding country agricultural. The town was first settled in 1871 and became a city in 1882. Pop. 1900, 7,652.

Grand Haven, Ottawa co., Mich., on Lake Michigan, 31 mi. n.w. of Grand Rapids. Railroads: C. & W. M., and D. G. H. & M. It is a port of entry with steamboat lines to Chicago and Milwaukee, and is the center of the Michigan fruit belt, shipping about 1,000,000 crates of fruit annually to Chicago; also exports lumber and grain. It has important fisheries, shipbuilding yards, foundries, factories, etc. Pop. 1900, 4,743.

Grand Island, Hall co., Neb., 150 mi. w. of Omaha. Railroads: B. & M. R.; Union Pacific; St. J. & G. I.; and the Ord & Republican Valley. Industries: beet sugar factory, three flouring mills, iron foundry, broom, wire fence, and farm implement factories, brewery, and stock yards. Surrounding country agricultural. The town was first settled in 1857. Pop. 1900, 7,554.

Grand Pré, a beautiful village on the Basin of Minas, King's co., Nova Scotia; the scene of Longfellow's *Evangeline.* The French settlers there were expelled by order of the English in 1613. Pop. 1,600.

Grand Rapids, Kent co., Mich;, on Grand River, 150 mi. n.w. of Detroit. Railroads: C. & W. M.; D. G. H. & M.; G. R. & I.; Muskegon and G. R. & I.; Mich. Central; and L. S. & M.

S. Industries: furniture co., 7 flouring mills, 14 iron foundries and machine shops, and a very large number of other factories. Largest furniture factories in the world. The town was first settled in 1833 and became a city in 1850. Pop. 1900, 87,565

Grange (also called Patrons of Husbandry), in the U. S. a combination, society, or lodge of farmers for the purpose of promoting the interests of agriculture, more especially for abolishing the restraints and burdens imposed on it by the commercial classes, the railroad and canal companies, etc., and for doing away with middlemen. Granges originated in the great agricultural regions of the Mississippi, and still prevail most generally there.

Granite, an unstratified rock, composed generally of the minerals quartz, feldspar, and mica, mixed up without regular arrangement of the crystals. The grains vary in size from that of a pin's head to a mass of 2 or 3 ft., but they seldom exceed the size of a large gaming die. When they are of this size, or larger, the granite is said to be "coarse-grained." Granite is an igneous or fire-formed rock which has been exposed to great heat and pressure deep down in the earth. It is one of the most abundant of the igneous rocks seen at or near the surface of the earth, and was formerly considered as the foundation rock of the globe, or that upon which all sedimentary rocks repose; but it is now known to belong to various ages from the Pre-Cambrian to the Tertiary, the Alps of Europe containing granite of the later age. Granite supplies the most durable materials for building, as many of the ancient Egyptian monuments testify. It varies much in hardness as well as in color, in accordance with the nature and proportion of its constituent parts, so that there is much room for care and taste in its selection. Granite in which feldspar predominates is not well adapted for buildings, as it cracks and crumbles down in a few years. The Aberdeen bluish-gray granite is celebrated for its great durability, and also for its beauty. The Peterhead red granite, the hue of which is due to its feldspar being the flesh-colored potash variety called orthoclase, is highly esteemed for polished work, as columns, pillars, graveyard monuments, etc. Granite in which mica is replaced by hornblende is called *syenite;* when both mica and hornblende are present it is called *syenitic granite;* when talc supplants mica it is called *protogene, talcose,* or *chloritic granite;* a mixture of quartz and hypersthene, with scattered flakes of mica, is called *hypersthenic granite;* and the name of *graphic granite,* or *pegmatite,* is given to a variety composed of feldspar and quartz, with a little white mica, so arranged as to produce an irregular laminar structure. When a section of this latter mineral is made at right angles to the alternations of the constituent materials, broken lines resembling Hebrew characters present themselves; hence the name. The *Oriental basalt,* found in rolled masses in the deserts of Egypt, and of which the Egyptians made their statues, is a true granite, its black color being caused by the presence of hornblende and the black shade of the mica. The *Oriental red granite* chiefly found in Egypt, and of which Pompey's Pillar and Cleopatra's Needle were constructed, is composed of large grains or imperfectly formed crystals of flesh-colored feldspar, or transparent quartz, and of black hornblende.

Grant, in law, a gift in writing of such a thing as cannot be passed or conveyed by word only; thus, a grant is a regular method by the common law of transferring the property of incorporeal hereditaments, or such things whereof no actual delivery of possession can be had.

Grant, George Munro, D.D. (1835–), Canadian author and educationalist, b. in Nova Scotia. In 1877 he was appointed principal of Queen's University, Kingston, Ont., a position which he has filled with great ability. He has written *Ocean to Ocean.* being the account of a tour across the Dominion; has edited *Picturesque Canada,* and contributed to various periodicals.

Grant, James (1822–1887), novelist, b. at Edinburgh, lived in America from 1832 to 1839, in which year he returned to England. He resigned his commission in 1843; began to contribute to periodical literature, and in 1846 published his first book, *The Romance of War.* A large number of works followed, most of them bearing marks of his military training, or based on historical events. *Adventures of an Aide-de-Camp* (1848), *Bothwell* (1851), *Mary of Lorraine* (1860), *Dick Rodney* (1861), *White Cockade* (1867). Most of his works have been reprinted in the U. S.

Grant, Ulysses S. (1822–1885), general, and president of the U. S., b. at Point Pleasant, Clermont co., O. His real name was Hiram Ulysses Grant, the name afterward used by him having arisen out of an error in the registration of his cadetship. After graduating in the military academy at West Point he served during the Mexican War, taking part in every battle except Buena Vista, and being brevetted captain for gallantry. In 1854 he resigned his commission, and engaged first in farming near St. Louis, and then in the leather trade with his father at Galena, Ill. On the declaration of war in 1861 he was chosen captain of a company of volunteers, and was soon promoted to a brigadier generalship of volunteers. He seized Paducah, completed the Tennessee and Ohio navigation, blocked the departure of reinforcements from Belmont, captured Fort Henry and Fort Donelson, and won the two days' battle of Shiloh. He then gained a new victory at Iuka, and after repulsing the Confederates before Corinth commenced operations against Vicksburg. After a siege of some months, in the course of which he took the town of Jackson and scattered an army under Johnston, the town surrendered. For this Grant was made major general in the regular army, and placed in command of the Mississippi division. The battles of Chickamauga and Chattanooga, which followed, opened the way into Georgia for the Federal troops. In March, 1864, he

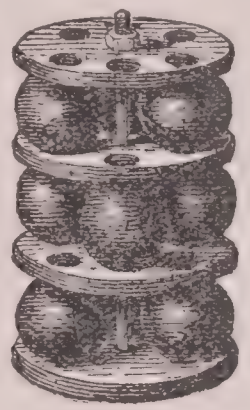
was appointed lieutenant general, and assumed command of the armies of the U. S. In a succession of hotly contested battles at the Wilderness, Spottsylvania, North Anna, and Cold Harbor, he steadily advanced on Petersburg and Richmond. These speedily fell, and Lee, defeated at Five Forks and completely surrounded, surrendered to Grant, April 9, 1865. Grant returned to Washington, and in 1866 was made general of the armies of the U. S. After exercising an important influence during the presidency of Johnson, Lincoln's successor, he was himself elected president in 1868. His administration allayed the soreness which still survived from the great struggle between the states, and was also noteworthy for the reduction of the national debt, and the settlement of the *Alabama* dispute with England. He was re-elected in 1872. On his retirement he spent some time in travel, making a trip around the world. Latterly he became involved in a bubble company which exploited his name and left him heavily in debt. He was candidate for the nomination of president before the National Republican Convention at Cincinnati in 1879, but was unsuccessful. He endeavored to repair his fortune by writing and publishing his *Memoirs*, and in this he was successful, though suffering greatly from the cancerous disease of which he died.

Granulation, the subdivision of a metal into small pieces or thin films, effected either by pouring the metal in a fine stream, or through a sieve into water. It is employed in chemistry to increase the surface, so as to render the metal more susceptible to the action of reagents, and in metallurgy for the subdivision of a tough metal like copper. Small shot is made by a species of granulation.

Granulation, in surgery, the formation of little grain-like fleshy bodies on the surfaces of ulcers and suppurating wounds, serving both for filling up the cavities and bringing nearer together and uniting their sides. The color of healthy granulations is a deep, florid red. When livid, they are unhealthy, and have only a languid circulation.

Granvella (or Granvelle) ANTOINE PERRENOT, CARDINAL DE (1517–1586), minister of state to Charles V and Philip II of Spain, was b. near Besançon. He studied at Padua and at Louvain, in his twenty-third year was appointed bishop of Arras, and was present at the diets at Worms and Ratisbon. In 1552 he negotiated the Treaty of Passau, and in 1553 arranged the marriage of Don Philip with Mary, queen of England. Under Philip II he remained chief minister, and in 1559 negotiated the Peace of Câteau-Cambrésis. Philip immediately after quitted the Netherlands, leaving Margaret of Parma as governor, and Granvella as her minister. In 1560 he became archbishop of Mechlin, and in 1561 was made a cardinal; but in 1564 he was obliged to yield to the growing discontent aroused by his tyranny in the Netherlands, resign his post, and retire to Besançon. In 1570 Philip sent him to Rome to conclude an alliance with the pope and the Venetians against the Turks, and afterward to Naples as viceroy. In 1575 he was recalled to Spain, and placed at the head of the government with the title of president of the Supreme Council of Italy and Castile. In 1584 he was created archbishop of Besancon, and d. at Madrid. He preserved all letters and despatches addressed to him, nine volumes of which, published 1851–62, are of value in illustrating the history of the sixteenth century.

Granville (GRANVILLE GEORGE LEVESON-GOWER), second earl, K. G. (1815–1891), English statesman, was b. in London. In 1855 he became chancellor of the Duchy of Lancaster, president of the council, and ministerial leader of the House of Lords (1855–58), and in 1856 represented the British crown at the coronation of the Czar Alexander. From 1859 to 1866 he was again president of the council. In 1868 he was colonial secretary under Gladstone, and on the death of Clarendon in 1870 succeeded to the secretaryship for foreign affairs, which he held until 1874. During this period he negotiated the Treaty of 1870, guaranteeing the independence of Belgium, and "protested" against the Russian repudiation of the Black Sea clause of the Treaty of Paris. On the return of Gladstone to office in 1880, Lord Granville again became foreign secretary, until Lord Salisbury came into power in 1885. The close of the struggle with the Boers, the protest against the French occupation of Tunis, the revolt of Arabi Pasha in Egypt, the appearance of the Mahdi, the occupation of Egypt, the Gordon mission, and Wolseley expedition belong to this period.



Grape-shot.

Grape-shot, a kind of shot generally consisting of three tiers of cast-iron balls arranged, three in a tier, between four parallel iron discs connected together by a central wrought-iron pin. Case-shot is now used more than grape-shot.

Graph'ite, one of the forms under which carbon occurs in nature, also known under the names of *Plumbago*, *Black-lead*, and *Wad*. It occurs not unfrequently as a mineral production, and is found in great purity at Borrowdale in Cumberland, and in large quantities in Canada, Ceylon, and Bohemia. Graphite may be heated to any extent in close vessels without change; it is exceedingly unchangeable in the air; it has an iron-gray color, metallic luster, and granular texture, and is soft and unctuous to the touch. It is used chiefly in the manufacture of pencils, crucibles, and portable furnaces, in burnishing iron to protect it from rust, for giving a smooth surface to casting molds, for coating wax or other impressions of objects designed to be electrotyped, and for counteracting friction between the rubbing surfaces of wood or metal in machinery.

Graph'otype, a process for obtaining blocks for surface printing, discovered in 1860 by De Witt Clinton Hitchcock, who observed that, on rubbing the enamel from a visiting card with a brush and water, the printed letters

stood out in relief, the ink having so hardened the enamel that it resisted the action of the brush. The first graphotype drawings were made on blocks of chalk with siliceous ink, but the chalk block was soon superseded by the use of French chalk ground to the finest powder, laid on a smooth plate of zinc, submitted to intense hydraulic pressure and then sized. The drawing is made with sable-hair brushes, and ink composed of lamp-black and glue, and when finished is gently rubbed with silk velvet or fitch-hair brushes until the chalk between the ink lines is removed to the depth of $\frac{1}{8}$ inch. The block is then hardened by being steeped in an alkaline silicate, and molds being taken from it, stereotype plates are cast for printing.

Grapple Plant, the Cape name of the *Harpagophytum procumbens*, a South African procumbent plant of the nat. order Pedaliaceæ. The seeds have many hooked thorns, and cling to the mouths of grazing cattle, causing considerable pain.

Grass Cloth, the name of certain beautiful, light fabrics made in the East from the fiber of *Boehmeria nivea*, or China grass, *Bromelia Pigna*, etc. None of the plants yielding the fiber are grasses.

Grasses, a name equivalent to the botanical order Graminaceæ, a very extensive and important order of endogenous plants, comprising about 250 genera and 4,500 species, including many of the most valuable pasture plants, all those which yield corn, the sugar cane, the tall and graceful bamboo, etc. The nutritious herbage and farinaceous seed furnished by many of them render them of incalculable importance, while the stems and leaves are useful for various textile and other purposes. In its popular use the term grasses is chiefly applied to the pasture grasses as distinct from the cereals, etc.; but it is also applied to some herbs, which are not in any strict sense grasses at all, e.g., rib-grass, scurvy, and whitlow grass. After the culture of herbage and forage plants became an important branch of husbandry, it became customary to call the clovers, trefoils, sainfoin, and other flowering plants grown as fodder, *artificial grasses*, by way of distinction from the grasses proper, which were termed *natural grasses*. Of the pasture grasses, some thrive in meadows, others in marshes, on upland fields, or on bleak hills, and they by no means grow indiscriminately. Indeed the species of grass will often indicate the quality of the soil; thus, *Holcus*, *Dactylis*, and *Bromus* are found on sterile land, *Festūca* and *Alopecūrus* on a better soil, *Poa* and *Cynosūrus* are only found in the best pasture land.

Grass′hopper, the name of various leaping insects of the order Orthoptera nearly akin to the locusts. They are characterized by very long and slender legs,—the thighs of the hinder legs being large and adapted for leaping,—by large and delicate wings, and by the wing covers extending far beyond the extremity of the abdomen, Grasshoppers form an extensive group of insects, and are distinguished by the power which they possess of leaping to a considerable distance, and by the stridulous or chirping noise the males produce by rubbing

Grasshopper, Female.

their wing covers together. They are generally of a greenish color.

Grass of Parnassus, a genus of plants, variously referred to the natural orders Droseraceæ and Hypericaceæ, and found for the most part in boggy situations in the colder northern countries. The common grass of Parnassus is a beautiful autumnal plant with heart-shaped leaves and a single yellowish white flower.

Grass Tree, the popular name of a genus of Australian plants of the nat. order Liliaceæ, having shrubby stems with tufts of long grass-like wiry foliage, from the centre of which arise the tall flower-stalks, which sometimes reach the height of 15 or 20 ft., and bear dense cylindrical spikes of blossom at their summit. The base of the leaves forms, when roasted, an agreeable article of diet, and the leaves themselves are used as fodder for all kinds of cattle. A resin, known in commerce as *akaroid resin*, is obtained from all the species, which are also popularly known as black-boys.

Grass Wrack (or Sea Grass), a phanerogamous plant belonging to the Naiadeæ, forming green beds at the bottom of the sea where it is of no great depth. When dried it is used for stuffing mattresses and packing goods. It has been recommended as a substitute for cotton. The ash contains soda.

Gratian (359–383) (otherwise Gratianus Augustus), Roman emperor, eldest son of the Emperor Valentinian I; was b. A.D. 359, and when only eight years of age raised by his father to the rank of Augustus. On the death of Valentinian in 375 the Eastern Empire remained subject to Valens, and Gratian was obliged to share the western part with his half-brother, Valentinian II, then four years old. In 378 he succeeded to the Eastern Empire, which he bestowed on Theodosius I. He was deserted by his soldiers while leading them against Maximus, and put to death at Lyons in the eighth year of his reign.

Grati′ola, a genus of plants, the hedge-hyssop genus, containing about twenty species of herbs, widely dispersed through the extra-tropical regions of the globe. *G. officinalis* grows in meadows in Europe. It is extremely bitter, and acts violently both as a purgative and emetic, and in overdoses it is a violent poison. *G. Virginica* is a native of the U. S.

Grattan, Henry (1746–1820), Irish orator and statesman, b. at Dublin, educated at Trinity College and Middle Temple; called to the Irish

bar in 1772, and in 1775 elected member for Charlton in the Parliament of Ireland. In 1780 he moved resolutions asserting the crown to be the only link between Britain and Ireland, and in 1782 led the volunteer movement, which was instrumental in securing the concession of independence to Ireland. For these services the Irish Parliament voted him £50,000 and a house and lands. In 1800 he came forward as member for Wicklow to oppose the Union, and on the passage of Pitt's measure was returned to the imperial Parliament in 1805 for Malton in Yorkshire, and in 1806 for Dublin. A tombstone in Westminster Abbey marks his burial place.

Gratz (or Graz), a town of Austria, capital of Styria, picturesquely situated on the Mur, 90 mi. s.w. of Vienna. The Schlossberg rises 400 ft. above the river, but the fortifications of the town have given place to avenues and pleasure grounds. The university, founded in 1586, has over 1,100 students and a library of 80,000 volumes. The Joanneum, for the promotion of agriculture and scientific education, has a large library and museums. The manufactures consist of woolen, cotton, and silk tissues, machinery, steel, rails, wagons, soap, leather, ironware, etc. Pop. 97,791

Gravelotte (gråv-lot), a village, Germany, province of Elsass-Lothringen, 7 mi. w. of Metz, the scene of one of the fiercest battles of the Franco-German war, resulting in the retreat of the French to Metz.

Gravesend, a municipal and parliamentary borough of England in Kent, on the south bank of the Thames, 21 mi. e. of London. It is a great rendezvous for shipping, the boundary port of London, and troops and passengers frequently embark there to avoid the passage down the river. There is some trade in supplying ships' stores, and boat building, iron-founding, etc., are carried on. Total pop. 59,559.

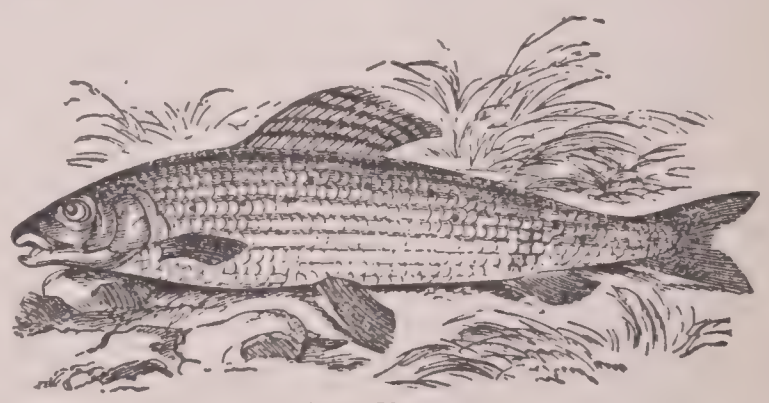
Gravity (or Gravitation), the tendency of bodies toward the center of gravity, or toward each other. According to the law of gravitation discovered by Newton, every portion of matter attracts every other portion of matter with a force directly proportional to the product of their masses, and inversely proportional to the square of the distance between them. The force of gravity is least at the equator, and gradually increases as we recede toward the poles. Thus, a given mass, if tested by means of a spring balance of sufficient delicacy, would appear to weigh least at the equator, and would seem to get heavier and heavier as the latitude increases. This is due to two causes: first, the centrifugal force at the equator is greater than that in high latitudes, because of the greater radius of the circle described at that place; and, second, the attraction is diminished by the greater distance of objects on the surface from the earth's center. From both causes combined a body which weighs 194 pounds at the equator would weigh 195 pounds at either pole. Experiments to determine the force of gravity from point to point are made by determining the length of a pendulum that beats seconds at each place. By experiments made by Captain Kater at Leith Fort it was found that the force of gravity at that place is such that a body, unresisted by air or otherwise, would acquire in one second, under its influence, a velocity of 32.207 ft. per second. At Greenwich the acceleration is 32.1912 ft.

Gravity, Specific. See *Specific Gravity.*

Gray, Asa (1810–1888), American botanist. He was appointed Fisher professor of natural history in Harvard University in 1842 and held the chair till 1873, when he retired from its more active duties. His works include *Elements of Botany* (1836), *A Manual of Botany* (1848), and other botanical text-books; also portions of works on the flora of North America and the *Genera Boreali-Americana, a Free Examination of Darwin's Treatise* (1861), a volume entitled *Darwiniana* (1876), etc.

Gray, Thomas (1716-1771), English poet, b. in London, educated at Eton with Horace Walpole, and at Cambridge. In 1738 he entered himself at the Inner Temple, but accompanied Walpole in his tour of Europe until they quarreled in Italy. He returned to England in 1741, and on the death of his father took up residence at Cambridge. In 1747 his *Ode on a Distant Prospect of Eton College* appeared, and in 1751 his *Elegy Written in a Country Churchyard,* which went through four editions in two months. In 1757 he declined the laureateship, and in the same year published his odes, *On the Progress of Poesy* and *The Bard.* His chief poems other than those mentioned were the *Ode for Music* and the fragmentary *Essay on the Alliance of Education and Government.* In Latin verse he is surpassed by few, and his letters are admirable specimens of the epistolary style.

Grayling, a genus of fishes of the family Salmonidæ. The common grayling is found in many English streams, but not in Scotland or Ireland. It is scattered over Europe from Lapland to North Italy, and also over part of Asia. The grayling prefers rapid streams



Grayling.

where the water is clear and cool, and the bottom sandy or pebbly, and it requires on the whole deeper water than the trout, to which it has a certain similarity in habit. The general color is yellowish brown, including the fins; several deeper brown lines run along the body; under the belly white. The color often varies in different streams. It is a favorite fish of the angler. In North America there is also a grayling, found in Great Bear and Winter

Lakes, and in tributaries to the McKenzie River, which is both delicate eating and furnishes good sport.

Great Britain, the island consisting of the three countries, England, Scotland, and Wales, the name being also used as equivalent to the British Islands collectively, or to the British Empire. Great Britain and Ireland, with their connected islands, form the United Kingdom of Great Britain and Ireland.

Great Britain and Ireland are separated from each other by the Irish Sea, which, near the center, attains its greatest width of about 130 mi.; but between the Mull of Cantyre in Scotland and Fair Head in Ireland is only about 12 mi. Great Britain is the largest island in Europe, and the seventh largest in the world. Its nearest approach to the continent of Europe is at its s.e. extremity, where the Strait of Dover, separating it from France, is only 21 mi. broad. Its length, measured on a line bearing n. by w. from Rye to Dunnet Head, is 608 mi. The breadth varies from 32 to 280 mi. Ireland's greatest length straight north and south is 230 mi., and its greatest breadth from west to east is 180 mi. Total area of British Isles is 120,839 sq. mi.

Surface.—The n. part of Britain is, for the most part, rugged, mountainous, and barren, this being the character of much of Scotland. To the n. of a line drawn from the Firth of Clyde on the w. to Stonehaven on the e. coast is the region generally known as the Highlands, divided into a northern and a southern portion by the great hollow of Glenmore through which runs the Caledonian Canal. The chief feature of the south is the mountain mass of the Grampians, which reach a height of 4,406 and 4,296 ft. South of the Highlands lies the plain of the Forth and Clyde, a region of coal and iron, in which the chief manufacturing industries of Scotland are carried on. South of this again is the elevated region of the Southern Highlands or Southern Uplands, less rugged and more pastoral than the Highlands proper. Toward the s.e. are the Cheviot Hills, on the borders of England and Scotland. Here commences the long Pennine chain running south into England, branching off into the mountains of Cumberland and the Lake district (Cambrian Mountains), and terminating beyond the Peak of Derby, in the heart of England. The highest summit of the English mountains is in the n.w. (Lake district), namely, Scawfell, 3,210 ft. Further south and west is the Cambrian range, spread over the greater part of Wales, and containing, among others, the highest mountain of S. Britain—Snowdon, 3,571 ft. Over great parts of England the elevations are mostly insignificant, and the general character of the country is that of undulating plains. In Ireland the most marked feature is the expanse of bogs which stretches over its interior. Carn Tual, in the s.w., the culminating point of the island, is 3,404 ft. high.

Rivers and Lakes.—The mountains which constitute the principal watersheds of Great Britain being generally at no great distance from the w. coast, the rivers which descend from them in that direction have generally a short course, and are comparatively unimportant. The two great exceptions to this rule are the Clyde and the Severn, which owe both their volume and the length of their course to a series of longitudinal valleys, which, instead of opening directly to the coast, take a somewhat parallel direction. The chief rivers entering the sea on the e. coast, proceeding from n. to s., are the Spey, Don, Dee, Tay, Forth, Tweed, Tyne, Ouse, Trent, and Thames, the last named in navigable importance the greatest river of the world. Owing to the great central flat of Ireland its rivers usually flow on in a gently winding course in different directions to the sea. The Shannon is the longest river of the British Isles, its length being about 225 mi. The Tay (length 130 mi.) is said to have the largest volume of water. The lakes of the British Isles are distinguished for beauty rather than size; the largest, but among the least interesting, is Lough Neagh, in the north of Ireland. .

Climate.—Their maritime situation has a favorable effect on the climate of the British Isles, making it milder and more equable than that of continental countries in the same latitude. The temperature of the Atlantic, raised by the influx of the Gulf Stream, is communicated to the winds and vapors which are wafted along its surface, and the prevailing winds in Britain being from the southwest, the country is kept constantly at a relatively high temperature. Ireland, from its more westerly position, has these characteristics in the most marked degree, the warmth and moisture of the west winds making it markedly a "green isle." For the same reason the western shores of the islands have a milder and more equable temperature than the eastern shores, the former being on an average one or two degrees cooler in summer and several degrees warmer in winter. The range of temperature between the coldest and the warmest months is at London 26°, in England generally 24½°, while at Paris it is 30°. The range at Edinburgh is 25°. The mean winter temperature at Dublin is 39°.

Agriculture.—In almost every district in Great Britain where the plow can move, farming of a superior description may be seen. Thorough and systematic draining, the extensive use of artificial manure, and the employment of the newest implements are among the chief features of modern British agriculture. The principal cereal crops grown in England are wheat, barley, and oats, wheat covering the largest area; the principal green crops are turnips, potatoes, mangolds, vetches, etc. In Ireland and Scotland oats are by far the principal grain crop; by far the chief green crop being in Ireland potatoes, in Scotland turnips. Hops are grown to a large extent in Kent, and less extensively in some other parts of Southern England.

Minerals.—Among mineral products the first place is due to *coal*, which, in regard both to the quantity raised annually and its aggregate value, surpasses any other mineral product.

Great Britain

The coal fields are not confined to one particular district, but extend as a series of basins in an irregular curve from central Scotland through northern and middle England to the Bristol Channel. On the east side of Scotland there are coal fields both north and south of the Forth; farther west lie the coal basins of Lanark, Renfrew, and Ayrshire; the first famous throughout the world for the immense manufacturing establishments which it mainly has called into existence and made prosperous. In the north of England is the great coal field centering near Newcastle, which gives it its name. The proximity of this field to the sea, and the excellence of the coal, unrivaled for domestic use, early made it a great theater of mining operations. The next coal field to the s. includes a large central space comprising parts of Yorkshire, Derbyshire, Nottinghamshire, and Lancashire, and divided by a separating belt of the lower strata of the carboniferous system into a kind of twin fields, the one of which extends from Leeds to Nottingham, while the other has its greatest length from s.w. to n.e., and borders, at its e. and w. extremities respectively, on Manchester and Liverpool. The only other coal field of a magnitude similar to those already mentioned is that of South Wales. There are several minor fields, as the North Staffordshire, the Shropshire, the Warwickshire, and the South Staffordshire. No coal to speak of is got in Ireland. The *iron* ores smelted in Great Britain are principally carbonates. The most important ironstone districts are those of Yorkshire, especially the rich Cleveland district in the North Riding, Lancashire, Cumberland, Staffordshire, Lincolnshire, Northamptonshire, and the coal measures of Scotland. Blast furnaces are most numerous in Yorkshire, Staffordshire, Cumberland, Durham, Lancashire, South Wales, and Lanarkshire. Tin, lead, and zinc are the metals next in importance to iron. Another important article is salt, chiefly from rock salt and brine pits. Granite, freestone, and roofing slate quarries are numerous, except in the southeastern part of England.

Fisheries.—The principal British fisheries are those of salmon, herring, haddock, ling and cod, turbot, soles, and other flat fish. The first is carried on chiefly in the rivers and estuaries of Scotland and Ireland; the second chiefly on the coasts and islands of Scotland, large quantities of herrings being cured and exported. Cod, haddocks, etc., are caught in great multitudes in the North Sea, particularly on the Dogger Bank. Among minor fisheries may be mentioned those of mackerel, pilchards, oysters, and lobsters.

Manufactures.—Taking these in the order of their importance, we begin with *cotton.* In this branch of industry Great Britain still remains a long way ahead of other countries. The Liverpool and Manchester district and S. Lancashire as a whole are the chief seats of the manufacture. The peculiar excellence of the wool furnished by the English flocks made *woolens* the most ancient and for centuries the staple manufacture of England. Now this manufacture is next in importance to that of cotton, and draws largely for its supplies on other countries, particularly on the Australian colonies. The chief seats of the woolen manufacture are in England—the West Riding of Yorkshire, Lancashire, Gloucestershire, and Wiltshire being the most distinguished for broadcloths; Norfolk for worsted stuffs, Leicestershire and Nottinghamshire for woolen hosiery. Blankets and flannels have numerous localities, but for the finer qualities the west of England and several of the Welsh counties are most conspicuous. Carpets of every quality and pattern are extensively made at Kidderminster, Halifax, Leeds, etc. The woolen manufacture of Ireland is on a very limited scale, being confined to a few broadcloth factories, and a few blankets and flannels. Scotland has made much more progress, but still bears no proportion to England. The chief seats of the Scotch woolens are Kilmarnock for carpets, bonnets, and shawls; Stirling and its neighborhood for carpets and tartans; Ayrshire for blankets, etc., Galashiels, Selkirk, and other places in the basin of the Tweed for the cloth known as "tweeds," the manufacture of which originated here, though it has since extended to several parts of England. The *linen* manufacture is also important. In England the chief seat of the manufacture is Leeds and its vicinity, and other parts of the West Riding; also parts of Lancashire and Durham. Linen is the only staple of Ireland, where it is carried on chiefly in the province of Ulster, Belfast being the great center of the industry. In Scotland the manufacture is important. Besides plain linen it includes osnaburgs, sheetings, sailcloth, sacking, etc.—chief seat, Dundee (with other Forfarshire towns); and diaper and damask—chief seat, Dunfermline. The staples of both towns are by far the most important of their kind in the kingdom. Large quantities of jute are also used in this manufacture, especially at Dundee. The *silk* manufacture is the only great textile industry in regard to which, at least in finer fabrics, Britain must yield the palm of superiority to other countries. The chief seats of the trade in England are the district of Spitalfields in London, Manchester, and Coventry. Besides the manufactures already mentioned, there are a great number which, though separately of less importance, absorb immense sums of capital, exhibit many of the most wonderful specimens of human ingenuity, and give subsistence to millions of the population. Among the most important of these are the several branches of the hardware industry, the manufacture of steam engines and all kinds of machinery, of arms and ammunition, of plate, jewelry, and watches, of chemicals, dyes, manures, etc., of furniture, of glass, earthenware, and porcelain, etc. Of vast extent also is the paper manufacture, in connection with which are various industries, of which it may be considered as, directly or indirectly, the parent—type founding, printing, books, engraving, etc.

Another very important industry is that of shipbuilding, which has its chief seats in the Clyde and Tyne.

Commerce.—Of the extent of the commerce carried on by railway, river, canal, and highway there are little or no means of forming an estimate. Britain carries on a commerce with almost all countries. The trade with her own colonies and dependencies is very large, but not more than one-third as much as with foreign countries. The foreign as well as the inland trade is greatly promoted by the highly developed system of communication which now exists. Thus there are upward of 20,000 mi. of railway open in the United Kingdom, of which about 14,000 mi. belong to England and Wales. For proportion of railways to area England taken by itself stands before any other country, having 1 mi. of railway to 4¾ mi. of surface. The total length of telegraph wires is 174,000 mi., the system as a whole belonging to the state. The number of messages sent annually is now over 50,000,000. The development of British shipping, when compared with that of other nations, is even more remarkable than that of its foreign commerce. Not only is the great bulk of the trade between Britain and other foreign countries carried on in British ships, but so also is a large part of the trade between one foreign country and another. Hence we find that the magnitude of the mercantile marine of the United Kingdom is far greater than that of any other country, its sea-going tonnage being double that of the U. S., and more than seven times that of France.

Religion.—Every form of religion enjoys the most complete toleration, but there are two churches, one in England having an Episcopal form of government, and one in Scotland with a Presbyterian organization, established by law and partly supported by state endowments. Both of these are Protestant, and both in England and Scotland the great majority of those who do not belong to the Established church are also Protestants. In England, however, these all belong to churches having a different organization from that of the Anglican Church, while in Scotland most of them belong to churches virtually identical with the Established church both in creed and in organization. In Ireland there has been no state church since 1871, when a branch of the Anglican Church there established was disestablished. The majority of the people are Catholics.

Education.—All education in England was formerly entirely voluntary. The first comprehensive measure for the promotion of elementary education by the state was passed in 1870. Its chief provisions were for the election of school boards in districts in which there was a deficiency of school accommodation, with power to build and maintain schools out of rates levied for the purpose; and for the giving of aid by parliamentary grant to these board schools as well as to previously existing schools. Discretionary power was originally given to the school boards to enforce the attendance of children in their districts, but by subsequent enactments compulsory attendance of children at school from 5 to 14 years of age has been made the law for the whole of England and Wales, a school-attendance committee being established to look after this matter wherever there is no school board. The most numerous schools are those connected with the National Society or Church of England. The Scotch Education act, passed in 1872, was from the first more comprehensive than the English one, requiring the election of school boards in every burgh and parish, and making school attendance compulsory throughout the country. The school age is from 5 to 13. Ireland is still behind in the matter of education. Elementary education there is under the superintendence of the commissioners of national education, a body incorporated in 1845, with power, among other things, to erect and maintain schools wherever they think proper. There is no compulsory school attendance in any part of Ireland. Free education—the entire abolition of fees—throughout the United Kingdom is advocated by some. Secondary education in Britain is left almost entirely to private enterprise, though some measures in furtherance of it have recently been taken by government. In England there are a number of endowed grammar schools, and also the great public schools of Eton, Harrow, Winchester, Rugby, Charterhouse, Westminster, etc. In Scotland and Ireland also there are a number of secondary schools: but they form no part of an organized system. Valuable results have been accomplished by the department of science and art, and technical education is beginning to receive attention.

For the higher education there are in England the universities of Oxford, Cambridge, London, Durham, and the Victoria University, Manchester; and in addition to these, colleges, some of them called "university colleges," at Leeds, Newcastle, Nottingham, Bristol, Birmingham, and other places, besides other institutions giving a university education in one or more departments; the training institutions for teachers; and the colleges belonging to the different dissenting bodies. London University is properly only an examining board, but in connection with it there are in London, University College and King's College. In Scotland there are the four universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews, a university college at Dundee, and the normal or training schools of the different religious bodies. Ireland has the University of Dublin, the Queen's Colleges of Belfast, Cork, and Galway, in connection with the Royal University of Ireland, which is merely an examining and degree-conferring body; the Roman Catholic university, and Maynooth and other Roman Catholic colleges.

People.—The earliest inhabitants of the United Kingdom known to history were Celts, who inhabited both Great Britain and Ireland at the time of the Roman occupation. In the fifth and sixth centuries, however, the Celts were displaced through the greater part of

South Britain and in the eastern lowlands of North Britain by the Anglo-Saxons, a Teutonic race from which the modern English and Lowland Scotch are mainly descended. The Celts as a distinct people were gradually confined to the mountainous districts of Wales and Cornwall and the Highlands of Scotland, and only in Wales and Scotland has the Celtic language survived in Great Britain, being still also spoken by many in the west of Ireland. There is a considerable Celtic element, however, among the population everywhere. The English language is the direct descendant of that spoken by the Anglo-Saxons, but contains a strong infusion of French elements introduced by the Normans in the eleventh and following centuries, as well as other elements, chiefly of Latin and Greek origin, introduced in later times.

The population of the United Kingdom is very unequally distributed in the three countries of which the kingdom is composed. England and Wales had, in 1881, a population equal to 445 to the sq. mi., which is a denser population than any country in Europe except Belgium and Saxony; that of Ireland at the same date was 158 to the sq. mi., and that of Scotland only 123. Except Middlesex, which is largely occupied by the metropolis, the most densely populated county in England is Lancashire, which has a population of above 1,800 to the sq. mi.; and the population of the two counties of Lanark and Renfrew, in Scotland, shows a ratio of above 1,000 to the sq. mi.; while East and West Flanders, in Belgium, the most densely populated district on the continent of Europe, have a population of only about 650 to the sq. mi. The increase that has taken place in the population of Great Britain during the present century is very remarkable. At the first census, which took place in 1801 (and which did not include Ireland), the whole population of Great Britain was found to be a little under 11,000,000; at the census of 1881 it was 29,700,000. The growth in the population of the whole kingdom between 1831, the date of the first reliable Irish census, and 1881, was from 24,400,000 to 35,000,000. This growth, however, was confined to Great Britain; for in Ireland the population has greatly declined (in 1841 it was fully 8,000,000).

The returned population in 1891 was 36,740,283, namely, England and Wales 29,001,018, Scotland 4,035,103, Ireland 4,706,162.

Extent of Empire.—The area of the British Empire may be stated in round numbers as about 9,000,000 sq. mi., with a population of about 312,000,000, distributed as follows: British Isles and possessions in Europe (Gibraltar, Malta, and Gozo); area 121,000 sq. mi.; pop. 1890, 38,165,526. British India and feudatory states, Ceylon, Straits Settlements, Hong-Kong, etc., in Asia; area 1,845,366; pop. 272,377,728. Cape Colony, Natal, Sierra Leone, Mauritius, St. Helena, and other possessions in Africa, or islands adjacent, 481,380 sq. mi; pop. about 4,961,500. Canada, Newfoundland, Jamaica, Trinidad, and other West India Islands; Honduras, Guyana, and all possessions in America, North or South, 3,614,224 sq. mi.; pop. 6,721,251. Australia, Tasmania, New Zealand, Fiji, New Guinea, etc.; area 3,259,199 sq. mi.; pop. 4,285,297. The increase of British colonies, especially of Canada and Australia, in population, wealth, and trade, has been something prodigious within the last few years. Self-government has been conceded to the larger colonies.

Constitution.—Under the name of a constitutional and hereditary monarchy the government of Britain is vested in a sovereign and the two houses of Parliament—the House of Lords and the House of Commons. Laws passed by these houses, and assented to by the sovereign, become the laws of the land. But under this general fixity of form the center of real power may change greatly, as it has in Great Britain within the last two centuries. The sovereign's right of veto on acts of Parliament has practically passed into desuetude, while of the two legislative houses the House of Commons, from its being the expression of the national will as a whole, has become the real center of power and influence.

The Sovereign.—The fundamental maxim upon which the right of succession to the throne depends is, that the crown is, by common law and constitutional custom, hereditary, and that the right of inheritance may from time to time be changed or limited by Parliament; under which limitations the crown still continues hereditary. It descends to the males in preference to the females, strictly adhering to the rule of primogeniture. The sovereign is of age at eighteen years. The heir to the crown has, since the time of Edward III, inherited the title of Duke of Cornwall, and receives that of Prince of Wales by letters patent. The power of the sovereign is limited by the laws. The divine right, so obstinately maintained by the Stuarts, was never recognized by the nation, and William III, Mary, and Anne ascended the throne, according to express declarations, only by virtue of a transmission of the crown to them by the nation. But the maxim has been acknowledged, particularly since the Restoration, that there is no power in the state superior to the royal prerogatives, the acts of the king are therefore subject to no examination, and the king is not personally responsible to any tribunal; hence the maxim, the king can do no wrong. Yet there is sufficient provision for confining the exercise of the royal power within the legal limits. 1, All royal acts are construed in accordance with the laws, and it is taken for granted that the king can never intend anything contrary to law. 2, The counselors of the king are responsible for the royal acts, and, as well as all those who are concerned in the execution of them, are liable to impeachment and examination, without the right of defending themselves by pleading the royal commands. 3, The Parliament and the judicial tribunals have also the right to discuss freely such royal acts, and, in particular, Parliament and each individual member of the

upper house, has the right to make remonstrances to the crown. 4, Individuals are protected from any abuses of the royal power by the habeas corpus act, the liability of the agents to prosecution, the right of complaining to Parliament, and the liberty of the press.

The Parliament.—The origin of the British Parliament has been sought rightly enough in the *witenagemôts* or national assemblies of the Anglo-Saxons. In a somewhat different form these were continued in the Norman times, and as early at least as the reign of Henry III we find not only the barons and the high ecclesiastics, but also the knights of the shire with the burgesses summoned to attend. These formed the *three estates*, now known as the lords spiritual, the lords temporal, and the commons. In the reign of Edward III (1327–77) the separation of the estates into two houses—the House of Lords, consisting of the lords spiritual and the lords temporal, and the House of Commons, consisting of the knights, citizens, and burgesses—became settled. All the peers were not originally entitled to a seat as a matter of right, but only those who were expressly summoned by the king. Every hereditary peerage now, however, confers the right of a seat in the House of Lords or Upper House. The number is indefinite, and may be increased at the pleasure of the crown, which, however, cannot deprive a peer of the dignity once bestowed. The Upper House at present comprises about 560 members. By the act of union with Scotland, 16 representatives of the Scottish peerage are elected by the Scottish nobility for each Parliament's duration (seven years), and 28 are elected for life by the peers of Ireland.

The Parliament is not permanent, and it is the royal prerogative to summon and dissolve it. The first business of the Commons is to elect a speaker. The members then take the oath of allegiance, and when this is done the queen's speech is read, being answered by an address from each house. In the upper house the lord-chancellor presides, holding the position of the speaker in the Commons. All grants of subsidies or parliamentary aids must originate with the House of Commons, and the lords have not the right to amend, but only to accept or reject, a money bill. As the Parliament is summoned, so it is prorogued by the royal authority. A dissolution of the Parliament is effected either by the authority of the crown, or by length of time. The House of Commons being chosen but for seven years, at the expiration of that time Parliament is dissolved *ipso facto*. The lower house of Parliament has the direction of all financial concerns; and there is no subject which may not be brought before it by petition, complaint, or motion of a member. The upper house is the supreme court of judicature in the nation. In civil cases it (now represented by the Lords of Appeal in Ordinary) is the supreme court of appeal from the superior tribunals of the three kingdoms. In the indictments for treason or felony, or misprision thereof, where the accused is a peer of the realm, the House of Lords are the judges of the law and the fact. In cases of impeachment by the House of Commons the House of Lords are also the judges. All the forms of a criminal trial are then observed, and the verdict must be by a majority of at least twelve votes.

Army and Navy.—The British army is raised on the authority of the sovereign, who is looked on as its head; but the number of troops and the cost of the different branches are regulated annually by a vote of the House of Commons. No British citizen is obliged to bear arms except for the defense of his country; but all able-bodied men, from eighteen to thirty-five are liable to militia service, the militia being raised, when required, by ballot. Enlistment among the regulars is for seven years' army service and five years' reserve service. The head of the military administration is the secretary of state for war.

The administration of the navy is carried on by the Board of Admiralty, consisting of six members, and having at its head the First Lord, who has supreme authority. The most important and formidable portion of the navy is the armor-clad fleet, which consists of about seventy vessels, including those not yet completed.

Finance, Revenue, and Expenditure.—The practise of borrowing money in order to defray a part of the war expenditure began in the reign of William III. At first it was customary to borrow upon the security of some tax, or portion of a tax, set apart as a fund for discharging the principal and the interest of the sum borrowed. This discharge was, however, very rarely effected; and at length the practise of borrowing for a fixed period was almost entirely abandoned, and most loans were made upon *interminable* annuities, or until such time as it might be convenient for government to pay off the principal. Originally the interest paid by the government on these loans was comparatively high and subject to considerable variation. But in the reign of George II a different practise was adopted. Instead of varying the interest upon the loan, the rate of interest was generally fixed at three or three and a half per cent., the necessary variation being made in the principal funded. Thus, if government were anxious to borrow in a three per cent. stock, and could not negotiate a loan for less than four and a half per cent. they effected their object by giving the lender, in return for every £100 advanced, £150 three per cent stock—that is, they bound the country to pay him or his assignees £4, 10*s*. a year in all time to come, or, otherwise, to extinguish the debt by a payment of £150. In consequence of this practise the principal of the debt now amounts to far more than the sum actually advanced by the lenders. At the death of William III the public debt, partly by reason of the long wars, amounted to £16,394,702, the public income being £3,895,205. By far the greater part of the next reign also was a time of war, and on the death of Queen Anne the national debt amounted to £54,145,363. The reign of George I was undisturbed

by war, which enabled the government of the time to reduce the debt by £2,053,125, so that at the accession of George II the whole amount of the debt was £52,092,238. At the conclusion of the Peace of Paris, after the Seven Years' War, it was £138,865,430, and at the end of the American War, £239,350,148. During the French War £601,500,334 of new debt was contracted, and on Feb. 1, 1817, when the English and Irish exchequers were consolidated, the total debt was £840,850,491. Since then the debt has been greatly reduced, and in 1890 the whole amount of it was $3,350,719,563.

History.—The island in the remotest times bore the name of *Albion.* From a very early period it was visited by Phœnicians, Carthaginians, and Greeks, for the purpose of obtaining tin. Cæsar's two expeditions, 55 and 54 B.C., made it known to the Romans, by whom it was generally called *Britannia;* but it was not till the time of Claudius, nearly a hundred years after, that the Romans made a serious attempt to convert Britain into a Roman province. Some forty years later, under Agricola, the ablest of the Roman generals in Britain, they had extended the limits of the Provincia Romana as far as the line of the Forth and the Clyde. Here the Roman armies came into contact with the Caledonians of the interior, described by Tacitus as large-limbed, red-haired men. After defeating the Caledonians under Galgacus at "Mons Grampius" Agricola marched victoriously northward as far as the Moray Firth, establishing stations and camps, remains of which are still to be seen. But the Romans were unable to retain their conquests in the northern part of the island, and were finally forced to abandon their northern wall and forts between the Clyde and the Forth and retire behind their second wall, built in 120 A.D. by Hadrian, between the Solway and the Tyne. Thus the southern part of the island alone remained Roman, and became specially known as Britannia, while the northern portion was distinctively called Caledonia. The capital of Roman Britain was York (Eboracum). Under the rule of the Romans many flourishing towns arose. Great roads were made, traversing the whole country and helping very much to develop its industries. Christianity was also introduced, and took the place of the Druidism of the native British. Under the tuition of the Romans the useful arts and even many of the refinements of life found their way into the southern part of the island.

Thus from the time of the Roman conquest, and still more decidedly after the Saxon invasions in the fifth century, the history of Britain branches off into a history of the southern part of the island, afterward known as England, and a history of the northern part of the island, afterward named Scotland. It was not till the union of the crowns in 1603 that the destinies of England and Scotland began again to unite; and it was not till the final union of the parliaments in 1707 that the histories of the two countries may be said to merge into one.

The measure which declared the parliaments of England and Scotland united, and the two countries one kingdom, known as the United Kingdom of Great Britain, was passed, after violent opposition, in the reign of Queen Anne, May 1, 1707. This union, however much it was opposed by the prejudices and interests of particular men or classes of the time, has contributed very much to the prosperity of both countries. The Grand Alliance, which it had been the aim of William's later years to form between Holland, Austria, and England against the threatening growth of French power, now held the field against the armies of France, and the victories of Marlborough at Blenheim and Ramillies, and the taking of Gibraltar and Barcelona, ended in the treaty of Utrecht in 1713, by which the British right of sovereignty over Hudson's Bay, Newfoundland, Nova Scotia, Minorca, and Gibraltar was acknowledged, and the foundation of Britain's imperial and colonial power securely laid. The remainder of Anne's reign was distracted by the never-ending altercations of domestic parties. She d. Aug. 1, 1714; and with her ended the line of the Stuarts, who had held the scepter of England 112, and that of Scotland 343 years.

At her death George I, elector of Hanover, maternally descended from Elizabeth, daughter of James I, according to the Act of Settlement ascended the throne of Britain. The Whigs under this prince regained that superiority in the national councils of which they had long been deprived, and this, along with the suspension of the habeas corpus act and some other extreme precautionary measures, increased the irritation of the Tory and Stuart party. In 1715 the Earl of Mar in Scotland and the Earl of Derwentwater in England raised the standard of rebellion and proclaimed the Chevalier St. George (the Old Pretender) king. But the insurrection, feebly supported by the people, was soon suppressed. In 1716 the Septennial act was passed, making Parliament of seven instead of three years' duration. In 1720 occurred the extraordinary growth and collapse of the South Sea Company. From this date till 1742 the government was virtually in the hands of Sir Robert Walpole, the first, we might say, of modern premiers, governing the cabinet and chiefly responsible for its doings. Walpole had great sagacity, prudence, and business ability, and could manage dexterously the king, the Parliament, and the people alike, It is true that in the case of the Parliament he achieved this by undue influence in elections and a scandalous use of bribery, but the power he thus acquired was generally wisely used. The failure of the war with Spain into which he had reluctantly entered drove him from office, and in 1742 his long ministry ended. In 1743 George II, frightened at the dangers to Hanover, dragged Britain into the wars between France, Prussia, and Austria, regarding the succession of the Emperor Charles. George himself fought at the head of his troops at Dettingen (1743), where he obtained a complete victory over the French, which was balanced, however, later on by the defeat at Fontenoy (1745).

A fresh attempt was now made to restore the Stuart family to the throne of Britain. Charles Edward, son of the Old Pretender, having been furnished by France with a small supply of money and arms, landed on the coast of Lochaber, in the Western Highlands, in 1745, and was joined by a considerable number of the people. Marching southward with 1,500 Highlanders, his forces increasing as he advanced, he entered Edinburgh without opposition; and having defeated Sir John Cope near Prestonpans he marched into England. He now took Carlisle, and advanced through Lancaster, Preston, and Manchester, to Derby, within 100 miles of London; but finding himself disappointed of expected succors from France and the English Tories, contrary to his expectations, keeping aloof, he commenced his retreat into Scotland, closely pursued by the king's troops, whom he again defeated at Falkirk. With this victory his good fortune terminated. The Duke of Cumberland having arrived from the Continent put himself at the head of the forces which were destined to check the rebels; and the armies having met at Culloden, near Inverness, Charles was completely defeated. After lurking for six months amidst the wilds of Inverness-shire, he at length, with much difficulty, escaped to France.

The War of the Austrian Succession, which still continued and which was the cause of hostilities between the French and British in India as well as elsewhere, was terminated by the treaty of Aix-la-Chapelle in 1748. During most of this period Pelham and his brother, the Duke of Newcastle, had been the ruling ministers, and in their hands the art of government had reached a low level both as regards morality and ability. In 1752 the *New Style* of reckoning time was introduced, and the *Old Style* being eleven days behind, the 3d of September, 1752, was called the 14th. At the same time the 1st of January was fixed as the opening day of the year, instead of the 25th of March.

Soon after, the French, uneasy at the growing colonial power of Britain, made a determined effort against the British colonies and possessions in North America and the East Indies, and at first the British met with severe disasters in America. In 1756 the Seven Years' War broke out, Austria and France being allied on the one side, and Prussia and England on the other, and ill success attended the British arms in Europe also. Fortunately, a great war minister, William Pitt, now took the helm of state. In 1758 the British made themselves masters of several French settlements in North America, while the attack made by Wolfe on Quebec in 1759 was completely successful, and gave Britain the whole of Canada. The same year the British and their allies defeated the French at Minden in Prussia. In the East Indies the French were even less successful than in America. Clive's victory at Plassey (1757) and Coote's at Wandewash (1760) secured the British empire in the East, and together with the naval feats of

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Hawke and Boscawen made England the greatest of maritime and colonial powers.

On the accession of George III in 1760 hostilities were still carried on, generally to the advantage of the French as far as the theater of war in Germany was concerned, but still more to their loss in the other quarters of the world where they were engaged with the British in a struggle for supremacy, and this notwithstanding that Spain had now joined her forces to that of France. At length the success of the British arms induced France and Spain to accede to terms, and the war ended by the Treaty of Paris in 1763. The French relinquished nearly all their possessions in North America; Minorca was restored to Britain; in the East Indies they got back their factories and settlements, on condition that they should maintain neither forts nor troops in Bengal; Cuba and Manilla were resigned to the Spaniards. In Europe everything was restored to the *status quo*.

The expenses of this war, which had been undertaken partly for the defense of the American colonies, had added upward of $360,000,000 to the national debt. It seemed to the British people to be just that the Americans should be taxed to assist in payment of the interest. The Americans did not deny the justice, but replied that if they were to be taxed they had a right to be represented in Parliament, in order that, like other British subjects, they might be taxed only in consequence of their own consent. Grenville, then the prime minister, stood to his purpose, however, and introduced a bill for imposing certain stamp duties on the American colonies. The Americans protested and resisted, and partly by the influence of the great Pitt, who had steadily opposed the measure, the bill was withdrawn. On the illness of Pitt, now Lord Chatham, 1767, Townshend became premier, and again revived the project of taxing the Americans by imposing duties on tea; and in 1770 Lord North, as his successor, set himself to carry it out. The result was that in 1775 America rebelled against the injustice, and a war began, in which both France and Spain joined the revolted colonies, and of which the result was the loss of all the American colonies except Canada, and the recognition of the independence of the U. S. On the American side of this struggle the great name is that of George Washington. On the British side the war was unskillfully conducted, and though they gained some successes these were more than counterbalanced by such blows as the capitulation of Burgoyne with nearly 6,000 men at Saratoga (1777), and of Cornwallis at Yorktown with 7,840 (1781). Against their European foes the British could show such successes as that of Admiral Rodney off Cape St. Vincent (1780); the brilliant defense of Gibraltar by General Eliot (1779–82); and Admiral Rodney's victory over the French fleet in the West Indies (1782). The war closed with the Peace of Versailles in 1783. Britain finally acquired several West Indian islands; Spain got Florida and Minorca, France Pondi-

cherry and Chandernagore in India. The struggle had added over $500,000,000 to the British national debt.

From 1783 to 1801 the government of Britain was directed by William Pitt, the younger son of Lord Chatham, who when only twenty-four years of age was placed as first lord of the treasury and chancellor of the exchequer. The affairs of Ireland and India, and the impeachment of Warren Hastings, were among the first subjects which occupied the attention of Pitt's ministry. In 1782 the Irish had been able to extort from Britain, then engaged in her struggle with the American colonies, the right to establish an independent parliament, so that from this year there were two independent governments in the British Isles till 1800, when Pitt, who had in the interval had some experience of the difficulties arising out of two co-ordinate legislatures, contrived once more to unite them.

In 1789 the French Revolution was begun. For a time there was considerable sympathy in England with this movement; but as the revolutionaries proceeded to extreme measures there was a reaction in English feeling, of which Edmund Burke became the great exponent, and the execution of Louis XVI gave rise to diplomatic measures, which finally terminated in the National Convention declaring war against Britain on Feb. 1, 1793. At first Britain co-operated with Prussia, Austria, etc., against France, and successes were gained both by sea and land; but latterly on the Continent the armies of the French Republic were everywhere triumphant, and in 1797 Britain stood alone in the conflict, and indeed soon found a European coalition formed against her. The war was now largely maritime, and the naval successes of Jervis off St. Vincent and Duncan off Camperdown were followed, when Bonaparte led an expedition to Egypt, having India as its ultimate object, by the victories of Nelson in Aboukir Bay, and Abercromby at Alexandria. In 1798 a rebellion in Ireland had to be crushed. Peace was made in 1802 by the Treaty of Amiens, only to be broken by another declaration of war in 1803, as the ambitious projects of Napoleon became evident. In spite of the efforts of Pitt (who died in 1806) in the way of forming and supporting with funds a new coalition against France, the military genius of Napoleon swept away all opposition on land, though the naval victory of Trafalgar (1805) established England's supremacy on the seas. Napoleon, who had assumed the title of Emperor of the French in 1805, and was now virtually the ruler of Europe, put forth his Berlin decrees (1807) prohibiting all commerce with Britain wherever his power reached, set his brother Joseph on the throne of Spain, and occupied Portugal. But the spirit of resistance had now taken deep root in the British people, and in 1808 troops were sent into Spain under Sir John Moore, and a year later Wellington, then General Wellesley, landed in Portugal. Then began that famous series of successful operations (the Peninsular War) which drove back the French into their own country, and

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powerfully contributed to undermine the immense fabric of Napoleon's conquests. The other chief European powers having united, Paris was occupied in 1814, Napoleon was deposed and exiled to Elba, and Louis XVIII placed on the throne of France. Escaping in 1815, Napoleon appeared once more in the field with a large army. Wellington and Blücher hastened to oppose him, and at Waterloo Napoleon's long career of conquest ended in a crushing defeat. The restoration of Louis followed, and Napoleon was sent to the prison of St. Helena. Of her conquests Britain retained Tobago, St. Lucia, Mauritius, the Cape of Good Hope, Demerara, Essequibo, Berbice, Heligoland, and Malta; Ceylon and Trinidad had been gained in 1802, so that Britain emerged from this long struggle with a very great increase of territorial possessions and political importance.

After the termination of the wars with Napoleon many things concurred to make a troublous era in the home administration. The new burden of debt which the wars had left on the nation, the bad harvests of 1816 and 1817, a succession of governments which had no idea but that of absolute resistance to all reforms, etc.; all these contributed to increase discontent. The result was a strong Radical agitation, accompanied often by serious riots throughout the country, more especially in the large towns, and loud demands for reform in Parliament and the system of representation. The death of George III and accession of George IV in 1820 made little change in this respect. From 1822 a succession of able statesmen, Canning, Peel, and Lord Grey, gave the government a more liberal turn, and did much to satisfy the popular demands. The Catholics were admitted to Parliament; the severity of the old restrictions on commerce was relaxed; and in the face of a determined opposition Earl Grey carried the Reform bill of 1832 (two years after the accession of William IV), which gave large manufacturing towns a voting power in some proportion to their importance, and practically transferred the center of political power from the aristocratic to the middle classes. The next great public measure was the abolition of negro slavery in every British possession in 1834.

William IV d. June 20, 1837, and was succeeded by Victoria. The year following is notable as that in which the Chartists began their movement for reform, which continued more or less active, with popular assemblies, presentation of monster petitions, and occasional tumults, till 1848, when it was without much trouble suppressed. The same year saw the struggle of the Anti-Corn-law League, of which Cobden and Bright were the chiefs, and which was finally successful; Sir Robert Peel, the leader of the Tory party, himself proposing the repeal of the corn duties (1846). The principle of free trade had further victories in the repeal of the navigation laws, and in the large abolition of duties made during Lord Aberdeen's ministry (1853).

In 1852–53 dissension arose between Russia

and Turkey regarding the rights of the Latin and Greek churches to preferable access to the "holy places" in Palestine. The emperor of Russia, resenting the concessions made to French devotees, sent Prince Menschikoff to Constantinople to demand redress, and not being satisfied, war was declared, June 26, 1853. On the plea that it was impossible to leave Russia a free hand in dealing with Turkey, France and Britain formed an alliance against Russia, March 28, 1854. The invasion of the Crimea followed; several important battles (Alma, Balaklava, Inkerman) took place, resulting in favor of the allies, till at length Sebastopol fell (1855), and peace was signed the following year at Paris. Russia ceded a part of Bessarabia to Turkey, and consented to the free navigation of the Danube and the neutrality of the Black Sea. See *Crimean War*.

Scarcely was the Crimean War over when Britain was threatened with the loss of her possessions in India through the mutiny of the Sepoys. For a time authority of government was entirely suspended throughout the greater part of Bengal, the whole of Oude, and a large portion of Central India, but in a comparatively short time 70,000 British troops, poured in from Burmah, Mauritius, the Cape, and elsewhere, entirely suppressed the rebellion. One result of the mutiny was that, by a bill passed Aug. 2, 1858, the sovereignty hitherto exercised over the British possessions in India by the East India Company was transferred to the British crown.

Two wars with China (1858 and 1860), during which Canton was bombarded and Pekin taken by the united forces of Britain and France, opened up five new Chinese ports to trade, with other advantages. The great Civil War in the U. S. had for a time a disastrous effect on the cotton trade in Lancashire, causing widespread distress. Between 1861 and 1867 the Fenian movement, which had for its object the separation of Ireland from the United Kingdom, occasioned some excitement.

Parliamentary reform was attempted by several governments without success, until the government of the Earl of Derby in 1867 passed a measure establishing the principle of household suffrage. This year also saw the passing of the act by which the Dominion of Canada was constituted. In 1867 the Abyssinian expedition set out, and effected its object —the relief of English captives in the spring of 1868. In the same year Lord Derby was succeeded by Mr. Disraeli as leader of the Conservative party, then in office. Before the end of the year a general election put the Liberals in power. In 1869 Mr. Gladstone's administration passed a bill for the disestablishment of the Irish Church. In 1870 an Irish Land Law bill, having for its object the regulation of the relations between landlord and tenant, became law; and during the same session the act of Parliament establishing a national system of education for England was passed. In 1871 the purchase of commissions in the army was abolished. Next followed

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the Ballot act and the Scotch Education act. Early in 1874 Mr. Gladstone dissolved Parliament, and a large Conservative majority being returned, Mr. Disraeli (afterward Earl of Beaconsfield) again became premier. The Ashantee War, begun the previous year, was brought to a successful termination early in 1874. In 1876 the title of Empress of India was added to the title of the queen. During the Russo-Turkish War of 1877–78 Britain remained neutral, but took an important part in the settlement effected by the Berlin Congress, and acquired from Turkey the right to occupy and administer Cyprus. Then followed a war in Afghanistan, a war with the Kaffres of Zululand, and a brief war with the Boers of the Transvaal.

A new Parliament was returned in 1880 with a large Liberal majority, and Mr. Gladstone once more became premier. This Parliament passed a land act for Ireland (1881), an act for putting down crime in Ireland (1882), a reform act equalizing the borough and county franchise (1884), and a redistribution of seats act (1885), both already described. The intervention of Britain in Egyptian affairs led to the bombardment of Alexandria by the British fleet (July, 1882), and the sending of an army into Egypt to quell the rebellion headed by Arabi Pasha, which was soon accomplished; while the rising under the Mahdi in the Soudan caused British troops to be dispatched to Suakim, and another force to be sent by way of the Nile (in the autumn of 1884) to relieve General Gordon at Khartoum, an object which it was too late to accomplish. A new Parliament was elected in the end of 1885, and for a brief period Lord Salisbury was premier, as he had latterly been in the preceding Parliament, but in February, 1886, he made way for Mr. Gladstone. On March 29, Mr. Gladstone gave notice of his intention to introduce a bill which, among other things, would establish a separate Irish legislative body, and withdraw the Irish members from the imperial Parliament. A determined opposition was organized, and a section of the Liberal party, headed by men mostly old colleagues of Mr. Gladstone, operated with the Conservatives and succeeded in throwing out the bill on its second reading. The result was the resignation of the Gladstone ministry, and a general election, in which the Unionists, or those opposed to the bill, had a great majority. The Conservative party assumed office, with the Marquis of Salisbury as head. A criminal law amendment act for Ireland (1887), and a local government act for England (1888), were passed. In 1887 the jubilee of the queen was celebrated. The elections of 1892 resulted in a Liberal victory and Mr. Gladstone became again premier.

The death of the duke of Clarence (eldest son of the Prince of Wales) made the duke of York heir to the throne. A marvelous development of the African gold fields increased the value of these colonial possessions. England mourned the loss of the poet Tennyson, and of the historian Freeman. The year 1893 was memorable for the Bering Sea arbitration, the

elevation of the American minister to ambassadorial rank, a campaign in Chitral, on the frontiers of India, the loss of the battleship *Victoria* off the coast of Tripoli, with 22 officers and 336 men, and the defeat of Gladstone's second Home Rule bill for Ireland. In 1894 Gladstone finally retired from public life, and was succeeded as prime minister by Lord Rosebery. The Jameson raid in the Transvaal caused much excitement in 1896. In 1897 Victoria celebrated her diamond jubilee, having reigned 60 years.

The great event of importance in recent British history was the outbreak of the war in South Africa in October, 1899. A full account of the war and the events leading up to it are given in detail in the article on the *Transvaal*, which see. It is enough to say here that Great Britain was unprepared for such a conflict. The Boers proved to be much stronger than the British thought. They were well prepared for war, and were familiar with the country in which they were fighting. The British lost heavily in the early part of the war, and it was not until a quarter of a million men were sent to South Africa that any progress at all was made.

Victoria's Death.—On January 22, 1901, Queen Victoria passed away, aged 82 years. She was born May 24, 1819; succeeded to the throne June 20, 1837, reigning nearly 64 years. On the day following the queen's death Albert Edward, Prince of Wales, was proclaimed king as Edward VII.

Great Circle Sailing (or tangent sailing), a method of navigating a vessel according to which her course is always kept as nearly as possible on a great circle of the sphere, that is, a circle which has for its center the center of the sphere. An arc of such a circle joining two places gives the shortest distance between them, consequently the course of a vessel sailing on this arc will be the shortest possible. A simple instrument called a spherograph is employed for finding the great circle course between places, and this is accompanied by tables compiled for the same purpose.

Great Eastern, an iron steamship, the largest vessel yet constructed, built (1854–58) at Millwall, on the Thames, for the Eastern Steam Navigation Co., by Mr. Scott Russell, from plans by Mr. I. K. Brunel; length, 680 ft.; breadth, 82½, or, including paddle-boxes, 118 ft.; height, 58 ft. (70 to top of bulwarks). She had six masts, five of iron and one of wood, and could spread 7,000 yards of sail, besides having eight engines, divided between her screws and paddles, and capable of working at 11,000 horse power. From the first her career was unfortunate, the launching process alone lasting three months, and costing $300,000. After several unremunerative trips to New York she was employed first as troopship and then as a cable-laying ship, for which her size and steadiness specially qualified her. Various attempts were afterward made to utilize her, but she at last became a mere holiday spectacle, and was broken up in 1888.

Great Fish or Back River, a river of North-

ern Canada, rising in Sussex Lake, and flowing after a course of about 500 mi., into Cockburn Bay, an inlet of the Arctic Ocean; discovered by Sir George Back.

Great Salt Lake, a lake, state of Utah, 4,000 ft. above sea level, 70 mi. in length n. to s. and 48 mi. e. to w. Five gallons of its water yield, by evaporation, 14 pints of salt. It has several islands, which, with its shores, are whitened by the salt; and it receives the Bear, the Utah, and several other streams. It contains no fish, but has several species of insects and a crustacean, and is frequented by immense flocks of gulls, ducks, geese, and swans.

Grebe, the common name of the birds of the genus *Podiceps*, family Colymbidæ, characterized by a straight, conical bill, no tail, tarsus short, toes flattened, separate, but broadly fringed at their edges by a firm membrane, and legs set so far back that on land the grebe assumes the upright position of the penguin. The geographical distribution of the genus is very wide, these birds haunting seas as well as

Great Crested Grebe

ponds and rivers. They are excellent swimmers and divers; feed on small fishes, frogs, crustaceans, and insects; and their nests, formed of a large quantity of grass, etc., are generally placed among reeds and sedges, and rise and fall with the water. Nine species are North American, some of them (crested grebe, horned grebe) being the same as those of Europe. The great crested grebe is about 21 to 22 in. long, and has been called satin grebe from its beautiful silvery breast plumage, much esteemed as material for ladies' muffs.

Greece, a country of southeastern Europe, comprising the peninsula south of the Turkish Empire and between the Ionian and the Ægean seas, together with the Ionian Islands, the Cyclades and Eubœa. Since 1832 a kingdom; the capital, Athens. Area 25,041 sq. mi.; and pop. 1896 est. 2,361,732. Ancient Greece included additional territory to the north, now a part of Turkey, and certain islands, as Crete and Cyprus; also, less exactly, the Greek colonies in Asia Minor, Africa, and Sicily. The northern boundary of ancient Greece varied greatly at different times. Macedonia, Illyria,

and Thrace, although at one period under Greek dominion, are not considered as belonging to Greece proper. The country is naturally divided into Northern Greece, extending to a line connecting the Maliac and the Ambracian gulfs; Central Greece, extending to the Isthmus of Corinth; and the Peloponnesus, including all s. and w. of that isthmus. The modern country includes all of the second and third division, and of Northern Greece, southeastern Epirus, and most of Thessaly. The mainland is remarkable for the numerous and deep indentations of gulfs and bays. Along the coast and to the e. and s. in the Ægean and Mediterranean are many islands, which were an important part of the ancient Greek state. The largest is Eubœa, 100 mi. long and 6 to 30 mi. wide. The mainland at its greatest length is 250 mi. long and 165 mi. wide. The surface is mountainous throughout. On the n. is the Cambunian range, and through the peninsula n. and s. run the Pindus Mountains. The mountains of the Peloponnesus are grouped about a central mass rising to a height of 8,000 ft. Among the highest and most famous peaks of Greece are Mt. Olympus, 9,750 ft., on the n. boundary; Parnassus, 8,068 ft., and Cithæron, 4,620 ft., in Central Greece; Taygetus, 7,904 ft., in Peloponnesus. The mountain ranges often determined the political as well as the physical divisions of ancient Greece. The rivers are small and of little account, except for the associations of history and legend. The climate of Greece is temperate and salubrious, but not now so healthy as it seems to have been in ancient times. The atmosphere is, like that of South Italy, remarkable for its clearness, especially in Attica. The soil is generally fertile, but until recent years agriculture has received little attention, though it was an important industry of ancient Greece. The chief products are olives and currants; less important are figs, lemons, cotton, tobacco. The various fruits of this latitude grow abundantly. Greek wines have always been highly valued, but the culture of the vine was for some time much neglected. About one third of the land is covered with forests, which include valuable species of wood for export. The silkworm is raised to some extent; also choice breeds of sheep. Some points on the coast have important fisheries. The lack of progress in agriculture and the poverty of the naturally fertile soil are due largely to the distracted condition of Greek affairs during a large portion of this century, and the consequent tendency of the people to neglect the arts of peace. The inevitable result has been continued embarrassment in the finances of the country.

The kingdom of Greece, founded in 1832, has had a constitutional government since 1844, and is now governed under the constitution of 1864, framed at the beginning of the present king's reign. The throne is hereditary and the king's oath to the constitution is required. He must be at least 18 years old, to exercise the functions of government. He must belong henceforth to the orthodox Greek Church, the present ruler being a Lutheran. The legislative power is shared with a single chamber, the *Boule*, members being elected for four years; they now number 207. State and military officials are not eligible; the right to vote belongs to all male citizens, except clergymen, over 21, who own property or have a fixed occupation. All citizens are equal; there is no nobility. The executive power is vested in the king and administered through his 7 ministers. The kingdom is divided into 16 monarchies, or departments, which are subdivided for purposes of local government into eparchies and demoi. Chief of the monarchies are Attica and Bœotia, Eubœa and the Sporades, Achaia and Elis, Arcadia, Laconia, Messinia, Argolis and Corinth, the Cyclades; Phthiotis and Phocis. The religion is almost exclusively that of the Greek Church; the foreign element of the population is very small. Military service is universal up to the age of 40, if necessary. It begins at 20 years of age and continues ordinarily 12 years; 3 years in active duty; 3 in the first reserve, and 6 in the second. These classes comprise the Greek army. The national guard, for the defense of the country in time of war, includes all citizens from 18 to 50 years of age. The present strength of the army on a peace footing is 28,470. The first reserve numbers 62,300; the second, 125,000; total army on war footing 215,770. The total possible strength is about 495,000. The navy is small and weak. The education law requires attendance at school of all children between 5 and 12 years, but it has not been successfully enforced. The schools are modeled in general upon the gymnasia and the *Realschulen* of Germany. The national university is located at Athens. Several foreign nations, among them Germany and the U. S., have established schools at Athens, to promote archæological investigation by their scholars. Work in this direction, and also in the excavation of ancient monuments of Greek art and history, has been active and fruitful in recent years. The introduction of improved machinery and other features of modern progress has been slow in Greece. The first railroad was not built until 1869. Athens, situated about 5 mi. from the harbor of Piræus, is the only large city. Pop. est. 1897, 108,000.

History.—The important period of Greek history ended two centuries before the beginning of the Christian era; but the traditions of past glory are warmly cherished, and the memory of a noble ancestry has done much to preserve the individuality and the characteristically intelligent patriotism of the Greek race during the many hundred years of enforced subservience to foreign powers. The earliest history of the Greeks is contained only in legends and fables. Their fabled ancestor was Hellen, whence they called themselves Hellenes, and the country Hellas, and continue to do so till the present day. The name by which they are known among other nations was given them by the early inhabitants of Italy, who knew them first through one of their northern tribes, the Græci. This became the Roman

designation, and thence passed into the other European languages. Hellen was said to be the son of Deucalion and Phyrra, the survivors of the deluge, and from his descendants came the four great divisions of the race, the Ionians, Dorians, Achæans, and Æolians. In the Heroic Age the Achæans seem to have been the predominant race, for their name was frequently used of the Greeks in general. The Ionians and the Dorians, however, were the important branches of historic times, and by them were founded the two great cities of Athens and Sparta, respectively. The Hellenes were preceded in Greece by a people whom they called Pelasgians. The relation between these two peoples is uncertain. The Pelasgians may have been a different branch of the Aryan race, or, more probably, the prehistoric ancestors of the Hellenes who had migrated at a much earlier period. The Hellenes themselves regarded them as a different race, probably because they found their language and civilization so different. They seem, however, to have readily blended with the later comers, whose superior qualities and culture enabled them to gain the ascendency and gradually absorb the earlier population. The original home of the Hellenes is uncertain; it is believed by some to have been Phrygia in Asia Minor, whence they reached Greece via the Hellespont or the Ægean Islands. Tradition said that arts of civilization and religious rites had been brought into Greece at a very early period, by Egyptian and Phœnician immigrants. Thus Cecrops was said to have brought Egyptian culture to Athens, whence the name Cecropia applied to the Athenian Acropolis. Danaüs had fled from Egypt with his 50 daughters, and founded Argos. Cadmus brought to Thebes the Phœnician art of writing, and the Greek alphabet certainly bears evidence of Phœnician origin. Probably all these legends have some historical foundation. So, too, the Phrygian Pelops, the ancestor of Agamemnon and Menelaus, gave his name to the southern peninsula, the Island of Pelops.

In the Heroic Age, which includes the period prior to the eighth century B.C., there flourished a race of men believed to have descended from the gods. Chief among these are Hercules, the hero of the twelve superhuman labors; Theseus, the favorite hero and legendary king of the Athenians; Minos, the famous lawgiver and king of Crete. To this period belong the expedition of the Argonauts in search of the Golden Fleece, the War of the Seven against Thebes, waged by the sons of Œdipus, and the famous Trojan War (1194–1184 (?) B.C.). The Dorian invasion and conquest of the Peloponnesus, known as the Return of the Heraclidæ (because the conquerors were the rightful heirs to the land, being the descendants of Heracles (Hercules) who had ruled there before the Trojan War) is placed 80 years later (1104 B.C.). It is probably the reminiscence of a migration and conquest by the Dorians from the n. extending over several centuries. From these conquests arose the Dorian states of the Peloponnesus. The establishment of Greek colonies in Asia Minor followed the Trojan War. At this time, too, the Dorians conquered and settled the islands of Rhodes, Cos, and Crete. The movement of the Dorians led to shifting among the Æolians and Ionians. Through the migration of the latter were founded the twelve cities on the coast of Asia Minor which later formed the famous Ionian confederacy. Of these were the splendid cities of Ephesus and Miletus. With these various movements the Heroic Age draws to a close. Many of the legends are treated by later poets and dramatists of Greece, but the earliest picture we have of those times is contained in the *Iliad* and *Odyssey* of Homer. Under poetical treatment truth and fiction were doubtless blended, but the general picture of society in the Heroic Age may be accepted as representing the belief of the Greeks themselves at that time. The authentic history of Greece begins with the First Olympiad (776 B.C.). From that year the names of the victors at the Olympian Games, held every four years, were carefully recorded, and so the Greeks made this the starting point of their chronology. Thus the third year of the Second Olympiad would be 770 B.C. To reduce a date given by Olympiad to ordinary chronology, multiply the number of the Olympiad by four, add the year of the Olympiad less one, and subtract the result from 780. The public games of the Greeks were at first a part of the rites for the dead, but they gradually developed into great religious festivals, and from a merely local event became of national importance. Four of these festivals became widely celebrated, the Olympiad, in honor of Zeus, at Olympia in the Peloponnesus; the Pythian, in honor of Apollo, near Dalphi; the Nemean, in honor of Zeus, at Nemea; and the Isthmian, in honor of Poseidon, on the Isthmus of Corinth. Of these the Olympian Games are most famous. An interesting feature of the Greeks' religious belief at this period was consultation of the oracles of Zeus and especially of Apollo. Of the twenty-two oracles of the latter god, the Delphic Oracle is most renowned.

The Amphictyonic Council was connected with the religious festivals, but was also political in character. Amphictyony was the name applied ("league of neighbors") to several associations of cities or tribes, but the Delphi Amphictyony became the most famous, and is the one now referred to. This league of twelve Hellenic tribes met alternately at Delphi and Thermopylæ. Its primary object was the protection of the temple of Apollo at Delphi, but the members also formed an offensive and defensive alliance, and took steps to lessen the cruelties of war. As an early instance of a movement toward international law it is most interesting. The Greeks were, then, at this period united by the ties of language—for the dialects were not radically different—customs, and religion; by confederacies for mutual protection when threatened from without, occasional or even permanent; by a feeling of patriotism and national pride, that came to despise all things not Greek as "bar-

barian." But of central controlling government there was none and could be none, for what state would yield an iota of its independence or dignity! The conditions were not unlike those prevailing in our own country under the Articles of Confederation. The period from 776 to 500 B. C. is marked chiefly by the gradual rise of Athens and Sparta—the latter from slight importance—to supremacy in the Greek world, and the development which made possible the resistance to the invader in the Græco-Persian Wars (500–479) and the glorious era which followed. This, in turn, is succeeded by the growing jealousy of the two great states, culminating in the Peloponnesian War (431–404), and the rapid decline of Grecian supremacy, restored for a brief period under a related branch of the Hellenic race, the Macedonian (338–323 B. C.), until the final incorporation into the Roman State (146 B. C.). The patriarchal monarchies of the Heroic Age, of which we read in the Homeric poems, had in most states given place to oligarchies or aristocracies by the beginning of the historic period. In Sparta the monarchy remained, but the two kings, who ruled jointly, were little more than shadow sovereigns. The divided counsels and the resulting contentions of the oligarchies gave rise in most of the states to the establishment of Tyrannies. The Tyrant, so-called, was not necessarily such a ruler as the title would imply, and his government was sometimes mild and just. He was usually one of the nobility who appeared as the champion of the people, and with their aid usurped the governmental power in periods of oligarchical anarchy and misrule. The tyrannies were usually short-lived, having to contend with the jealousy of excluded nobles and the inherent hatred of the Greeks to arbitrary rule. They were violently overthrown and their places taken by re-established oligarchies or by democracies. The Dorian cities, encouraged by Sparta, which itself never became a tyranny, preferred the former government, while Athens became the champion of democracy among the Ionian cities. The splendor of religious festivals, the improvement of public works, and the patronage of artists and poets, by which means they sought to make their rule attractive, mark the Age of the Tyrants as most important in the progress of Hellenic culture (650–500 B. C.). Most famous of the tyrants are Pisistratus at Athens (560–527); Periander of Corinth (625–585), a cruel despot, but most liberal patron of art and letters; Polycrates (535–522), who made the island of Samos a powerful maritime kingdom. During this period the Greek colonies along the Mediterranean became very numerous, many fleeing to escape the oppression of their fortunate rivals. Southern Italy became so thickly settled with Greeks that it came to be known as "Magna Græcia." Here were the important cities of Tarentum, Sybaris, and Rhegium. On Sicily was founded (734) the Dorian city of Syracuse; in the Gulf of Lyons the Ionian city of Massila (c. 600), the modern Marseilles; on the African coast

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Cyrene. These colonies were independent of the mother-country, but their influence in extending the glory and the commercial prestige of the Hellenic race was most important. As noted above, it is the story of Athens and Sparta in which centers the chief interest of the first three centuries of authentic Greek history. It is, in turn, to the great lawgivers and the constitutions which they framed that the origin of their growing supremacy is traced. In Sparta Lycurgus, who lived in the 9th century B. C., is credited by tradition with giving the laws which led to such wonderful results. In Athens the democratical constitution was established by Solon (594) and reformed by Cleisthenes (509). Sparta was at first overshadowed by Argos, but gradually rose to be the first city of the Peloponnesus, The Spartans were the descendants of the Dorian conquerors of the country, and stood in the relation of an army of occupation to the conquered Achæans, who were called Perioeci, or "dwellers around;" the city occupied by the Spartans was then simply a vast camp, not even protected by walls. The third class, the Helots, were slaves who had no rights and were the property of the state.

The laws and institutions of Sparta, which are ascribed to the single creative genius of Lycurgus, were probably the outgrowth of a long period of development, modified, arranged, and improved by the famous lawgiver, whose far-sighted wisdom enabled him to provide for the future. The government was vested in the two kings, of equal power, and twenty-eight elders, who were elected by the Popular Assembly, and must be at least sixty years of age. This latter body made the laws, but could consider only such questions as were submitted to them by the Senate, which included the kings and the elders. The power of the kings was hardly more than nominal, except in time of war. No debate on public questions was permitted, for the Spartans despised oratory and rhetoric and cultivated the mind only in the direction of martial exercise. Lycurgus is said to have redistributed the lands. Other characteristic laws required all to eat at common, public tables, the kings included; the use of iron money; the abstinence of all Spartans from trade or occupation other than athletic or military exercise; the absolute devotion of the youth to the service of the state, who taught them to say little and to suffer pain unflinchingly. "Laconic" (from Laconia, a Spartan possession) brevity and "Spartan" endurance became proverbial. The chief event in Spartan history prior to the Græco-Persian wars was the contest with Messenia, which after two wars (750–650 B.C.), was finally subjugated, whereby Sparta's power and territory were considerably increased. Sparta was now enabled to lead the sacred league that protected the shrine of Olympian Zeus, and through the Pan-Hellenic games celebrated there, to greatly extend her prestige. At Athens the line of kings ended about 1050 B.C. Among the famous rulers are mentioned Theseus, who is said to have united

the different Attic villages into a single city, and Codrus, the last of the line. His successor was called archon, or ruler, and the office was at first for life and hereditary in the family of Codrus. In time the office was made open to all the nobles, the term was reduced to ten years, and finally (683 B.C.) the number of archons was increased to nine, chosen annually. The people having demanded rights and protection from the wealthy nobles, one of the archons was appointed to frame a code. The result was "the bloody laws of Draco" (c. 620), according to which nearly every offense was punished with death. The rule of the archons came to an end soon after the fruitless rebellion of Cylon (612). In the period of anarchy which followed, the great lawgiver Solon was chosen to draw up a new code of laws (594 B.C.). He repealed many of the cruel Draconian laws, and established political rights upon a new basis, all citizens being divided into four classes according to income and irrespective of birth. He created the council of the Four Hundred, who presented questions to the Public Assembly and exercised the executive power, and extended the jurisdiction of the famous Tribunal of the Areopagus. This council henceforth had care of public morals and religion. Here Socrates was condemned to death (399 B.C.), and here St. Paul, centuries later, made his eloquent plea for Christianity. Most important of Solon's acts was the great power given to the "ecclesia," or Public Assembly. By it the archons and the senate was elected. Every citizen could vote and speak in support of his opinions. For important questions a quorum of 6,000 was required. Solon's ambitious nephew, Pisistratus (560–527), usurped the power, having cleverly won the sympathy and support of the people. Under him Athens prospered greatly. He built splendid temples and aqueducts, patronized letters, collected a library which was open to the public, and caused the poems of Homer to be collected and edited. His sons Hippias and Hipparchus at first ruled wisely, but the latter having been assassinated by a private enemy, his brother became very despotic and was finally expelled (510 B.C.). There now arose a strife between the nobles, who favored a return to aristocratical rule, and the people, who supported the constitution of Solon. Order was restored by Cleisthenes (509) who instituted the reforms which made the government still more democratic. He divided the people into ten tribes, which included all the free inhabitants of Attica, instead of the previous four tribes of Athens. Popular government was thus widely extended in the province. The Senate now contained 500 members, 50 from each tribe. Its powers and those of the popular assembly were increased, while many functions were taken from the archons and the Areopagus. Citizen trial by jury became frequent. Most famous of the institutions introduced by Cleisthenes was Ostracism.

The progress of democracy in Athens was viewed with bitter opposition by Sparta, and

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after the expulsion of Hippias, King Cleomenes sought to unite his Peloponnesian allies to restore the tyrant in Athens. His object was revenge for defeat inflicted upon him during two previous invasions of Attica. Failing to get the necessary support, Hippias returned to Asia Minor, and at the court of King Darius sought aid of the Persians. The Athenians had recently aided his revolted subjects in Ionia, and Darius was easily persuaded by Hippias to renew the war in earnest. The expedition sent in 492, under his son-in-law Mardonius, had met disastrous defeat, and the entire fleet had been lost at sea. In 490 the Persian army, 120,000 men, set sail in 600 galleys, under the command of Datis and Artaphernes, but guided by Hippias. After reducing the Cyclades and capturing Eretria, in Eubœa, they landed at Marathon, a few miles from Athens. The Athenians had made hurried preparations and raised an army of about 10,000. Sparta promised aid, but sent it too late to be of use. With this comparatively small force, Miltiades attacked the Persians in open battle and won a magnificent victory. The Persians were driven to their ships with a loss of 6,400 men, the Athenians losing 192. Marathon is justly reckoned one of "the decisive battles of the world." One party in Athens, led by Themistocles, believed that the Persian king would seek revenge, and accordingly urged that the naval power be strengthened; the other, led by Aristides, opposed this employment of the land force. That the former was right, soon appeared. Preparations were at once begun by Darius and continued by his son Xerxes. For eight years fleets and armies were gathered, an immense bridge of boats was constructed across the Hellespont, and finally in the spring of 480 B.C. the vast host, with Xerxes in command, began to move. The number is variously estimated from 1 to 2½ million. In Greece all was excitement and dismay, but owing to feuds and jealousies no definite plan was reached until the Persian host was almost on the march. Finally, through the efforts of Themistocles at the Congress of Corinth (481), a plan was agreed upon, whereby the Spartans were given chief command of both land and naval forces, the Athenians patriotically waiving their claim for the sake of harmony, and it was decided to make the first stand against the Persians at the Pass of Thermopylæ, which guards the entrance from Thessaly into Central Greece. Here Leonidas, the Spartan king, with 300 of his own soldiers and 6,000 allies, took his station. The celebration of the Olympian games prevented the Greeks from sending more troops to his support. Xerxes's plan to land forces in the rear of Leonidas was hindered by a storm which drove the Persian fleet ashore, wrecking 400 ships. His attack on the front was repeatedly repulsed by the brave defenders of the pass for two days, but finally a Greek betrayed to Xerxes a mountain path leading around to their rear. Leonidas learned of the danger, but held his ground with the valiant Spartans in the face of certain death.

All the allies, except 700 Thespians, availed of Leonidas's permission and fled. The brave handful of heroes were slain to a man (480). Meanwhile the Greek fleet was opposing the Persian armament at Artemesium, but on hearing of the defeat at Thermopylæ, they withdrew to the Gulf of Salamis. As the Persians advanced, the towns of Attica were deserted, the soldiers taking refuge on the ships at Salamis, others fleeing to a place of safety. The invaders ravaged all before them, and burned the empty towns, Athens included. Through a stratagem of Themistocles, who commanded the Greek fleet, Xerxes was induced to make an attack by sea. In the great naval battle of Salamis (480) the Persian fleet was utterly defeated. Leaving Mardonius with 300,000 men and a portion of the fleet, Xerxes began his inglorious retreat to Persia. The next year (479) in the battles of Platæa and Mycale the remaining land and naval Persian force was totally destroyed. The invaders had been finally overthrown, leaving behind them spoils enough to repay amply the havoc they had wrought. Athens was now the honored leader of the Grecian states, which place she held until the Peloponnesian War (431). The city was rebuilt and strongly fortified under the direction of Themistocles, the leader at this time, whose diplomacy defeated the efforts of jealous Sparta against the building of the walls. By his counsel, too, the naval strength of Athens was constantly increased. Because of dishonest practises for his personal benefit, the brilliant Themistocles was finally ostracised (471) and his rival, the patriotic general and statesman Aristides, became the leader in Athens. Through him had been successfully formed the Confederacy of Delos (477), which included the Ionian states of Asia Minor, the islands of the Ægean, and several Greek states, under the leadership of Athens, much to the dissatisfaction of Sparta. The members of the Delian League were gradually reduced from the position of confederates to that of tributaries, through the appropriation by Athens of their contributions to her own purposes; they furnished means to enlarge the fleets which kept them in subjection, whereas the contributions had been intended to aid the prosecution of war against the barbarians. Some members of the Confederacy tried to secede, but were subdued and punished by Athens. The voluntary Confederacy thus became an absolute monarchy under the rule of the Attic democracy, and the period is sometimes designated as that of the Athenian Empire.

After the expulsion of the Persians from Greece hostilities continued for some time in Asia Minor, in which Cimon, the son of Miltiades, distinguished himself. Through his victories he obtained great wealth, which he spent lavishly for the improvement of Athens, and accordingly became the foremost leader. He gave largely to the poor, and beautified the public walks and parks. His downfall and ostracism were due to his activity in urging the Athenians to aid the Spartans in suppressing a revolt of the Helots (464). The latter suspected their allies and discourteously dismissed them. Opposed to Cimon had been Pericles, who now became leader in Athens and gave her the most wise and liberal rule in her history. So famous is his statesmanship, so glorious the record of Greek art and letters in this period, that it is called the Periclean Age (459–431). The democracy of Athens was supreme, and by additional reforms, still more sweeping than those of Solon and Cleisthenes, political liberty was almost perfected. Never before or since has a government been so directly and solely in the hands of the people. Pericles's policy was to keep Athens the first state of Greece, and accordingly the naval power was strengthened, and the famous Long Walls were built. These united Athens to the ports of Piræus and Phalerum, enclosing the land and the sea-coast between them. The walls were 4 to 5 mi. long, 60 ft. high, and 8 to 10 ft. thick. The island of Ægina was subjugated to Athens (456). The jealousy of Sparta and the growing pretensions of Athens kept increasing the bitterness of their rivalry. Now Sparta was in the lead, now Athens, with all the cities of Bœotia, Phocis, and Locris under her power. After a disastrous defeat at Coronea (447), Athens sought peace, and the result was the Peace of Pericles, or Thirty Years' Truce (445). Sparta and Athens were each to retain undisputed leadership of the confederation it had formed, and new cities were free to join either they pleased. While Pericles thus failed to secure land supremacy for Athens, he established her maritime dominion, and in his vast schemes for beautifying the city he gave her the wonderful monuments of architecture and sculpture which have made Athens the marvel of the ages. At this time was erected the famous Parthenon. These great works were paid for with the moneys of the Delian Confederacy. To improve the condition of the poorer classes, he equalized the privileges and pleasures of social and political life. This was partly effected by introducing the custom of paying soldiers, jurymen, legislators, magistrates, and even minor civil officers. The very measures that were at first so advantageous laid the foundation of future corruption and decay, and the splendid luxury and supremacy were destined gradually to work the ruin of Athens, even as they had worked the ruin of an earlier empire in the East, and would in a few centuries undermine a still mightier empire in the West. Babylon, Athens, Rome,—their three object lessons for all posterity. The element of weakness in the Athenian fabric lay in the relation of the other states to their leader. Reduced from proud confederates to defenseless subjects, they watched eagerly for a chance to revolt, and this came with the outbreak of the fatal struggle between Athens and Sparta known as the Peloponnesian War (431–404 B. C.). The war was brought on by the interference of Athens in a quarrel between Corinth and her Corcyræan colony, and afterward by the punishment inflicted on Potidæa, a Corinthian

colony but a member of the Delian League, who attempted to secede. Corinth, backed by Ægina and Megara, appealed to Sparta for redress, and after consideration war was declared against Athens for her injustice, nearly the whole Peloponnesian Confederation endorsing their leader's action. The resources of Athens and Sparta were about evenly matched at the beginning, the former excelling in naval equipment, the latter in land forces. The war began with the attack of the Thebans on Platæa, a Bœotian city under the protection of Athens. Thebes was a strong ally of Sparta. The Thebans were taken prisoners by the Platæans and murdered, an outrage which hastened the crisis. A Spartan army at once overran Attica, and an Athenian fleet ravaged the Peloponnesus. The people of Attica took refuge within the walls of the city, and the Spartans burned and plundered to the very gates. Pericles feared to risk an open engagement. A horrible plague broke out in the crowded city (429), and among the victims was Pericles. Affairs at Athens were now controlled by unprincipled demagogues, of whom Cleon was the foremost. The popular assembly often descended to the level of a mob. The war was carried on with barbarous cruelty on both sides. Athens subdued Mytilene, on the island of Lesbos, and killed 1,000 of her nobles (428); the same year the Spartans captured Platæa, and slew every man in the city. For 10 years the destructive warfare went on, the possibility of peace being hindered by the unprincipled politicians of Athens. The Spartans having gained important victories under their able general, Brasidas, the Peace of Nicias was concluded (421). This provided for a truce of 50 years, but the peace was merely nominal, and petty conflicts were constantly occurring, although open war was not resumed for about seven years. The chief character during the second period of the war was Alcibiades, a brilliant but unprincipled demagogue of unlimited influence over the Athenian democracy. To him was due the fateful expedition against the Dorian city of Syracuse, in Sicily. His plan contemplated the subjugation of Sicily, Italy, and Carthage, and thereby the ultimate annihilation of Sparta. Recalled to Athens by his enemies to defend himself against a serious charge, Alcibiades fled to Sparta, and by his treacherous counsel effected the ruin of the splendid expedition. Athens never recovered from this blow, by which she lost the flower of her army and her fleet (413). The third period of the struggle, known as the Decelean War, was marked by repeated disasters and hopeless struggles for the Athenians, who had recalled Alcibiades to their aid. Finally the naval battle of Ægospotami (405) sealed the doom of Athens. The next year the proud city surrendered to Sparta, who spared the city itself, but demolished the long walls (404). The Spartan supremacy lasted 404–371, and was marked by the restoration of oppressive and tyrannical oligarchies upon the ruins of democracy.

In the year 401–400 B. C. occurred the famous expedition of the 10,000 in support of Cyrus the Persian satrap of Asia Minor, who had aided the Spartans in the Peloponnesian War and now was seeking the throne of Persia. After the disastrous end of the undertaking, the Greeks were led back by several generals chosen in place of those slain, among them the historian Xenophon. In revenge for the assistance given Cyrus by the Greeks, the Persian king, Artaxerxes, attacked the Greek cities of Asia Minor, who were aided by the Spartans under King Agesilaus. Artaxerxes sent envoys among the Grecian states who persuaded them to combine against Sparta. The result was the disastrous Corinthian War (395–387 B. C.), in which Athens, Thebes, and Corinth combined with the Persians against Sparta. It was ended by the Peace of Antalcidas, according to which all the Greek cities of Asia Minor were given to Persia. The Grecian states were made individually independent. Sparta, however, continued her tyrannical measures toward the other Greek cities until they finally rose against her under the leadership of Thebes. With the able guidance of Pelopidas and the famous general, Epaminondas, the revolt was speedily successful. In the great battle of Leuctra (371), the hitherto undefeated Spartan army was utterly overthrown. The Theban supremacy lasted only a few years, for the old-time rivals, Sparta and Athens, combined against her, and at the battle of Mantinea (362) her leader fell, and with him all her hopes. The century of internal strife had sapped the life of Greece, until now the several once powerful states lay exhausted. Civil war had effected what the hosts of Persia had found impossible. It is the story of independence carried to a fatal, self-destructive excess. When the growing power to the northward and the ambitious projects of the famous Philip of Macedon (359–336 B. C.) began to threaten Greece, she had neither the spirit nor the strength to offer more than a feeble resistance. By means of skillful intrigue and almost unopposed conquest, Philip got control of Olynthus, Thrace, and Phocis. At Athens, Demosthenes saw the coming peril, and in his famous *Philippics* urged his countrymen to meet it. On the field of Chæronea, in Bœotia, the allied Athenians and Thebans were mowed down before the Macedonian phalanx, and Philip's mastery was complete (338 B. C.) Inasmuch as the Macedonians were a Hellenic people, closely akin to the Greeks, identical in language and in religion, the period of their supremacy forms a brief but brilliant chapter in Greek history which belongs to the story of Alexander the Great (336–323 B. C.) The history of Greece and Macedonia for nearly two centuries after Alexander is marked by continued internal dissension, the invasion of the Gauls (279 B. C.), and the increasing danger from the rising power of the West. Most of the states were grouped under two confederacies, the Achæan and the Ætolian League. A united Greece might have remained independent, but under the conditions prevailing

she fell an easy prey to armies of Rome, and the feeble resistance ended with the capture and burning of Corinth in 146 B. C., after which Greece was made a province of the Roman Empire, under the name of Achaia. During the Mithridatic War (66 B. C.) the Greeks made a disastrous attempt to throw off the Roman yoke. During the period of peace following the establishment of the empire, Greece prospered under Roman rule. Her condition was most favorable during the reign of Augustus and later under Trajan and Hadrian. In the third century A. D., Greece was threatened by hordes of Goths. Athens retained her pre-eminence in art and letters, and to her schools the Roman youth were sent. The most interesting feature of Grecian history during this period is the wonderful progress of Christianity and its final triumph over the ancient paganism. In 330 Constantine removed the seat of the Roman Empire to Byzantium, afterward Constantinople. In 395 the Eastern Empire was formally separated from the Western. From this time until the capture of Constantinople by the Turks in 1453 Greece formed a part of the Byzantine Empire.

In 1146 Athens, Thebes, and Corinth were plundered by the Norman Roger, king of Sicily. After the Latin princes took Constantinople during the fourth Crusade (1203), Greece was divided between them. Governments were established by various Frankish princes, most important of which was the dukedom of Athens (1205–1456). After the fall of Constantinople, Greece was speedily subdued and incorporated into the Turkish Empire. Under the tyrannical and rapacious rule of their barbarous conquerors Greece sank into a pitiable condition, but the memory of their past and especially their devotion to the Christian church, in spite of the persecutions of their Moslem oppressors, kept the spark of liberty alive, until in the present century the long wished-for emancipation came. The leading men of Greece and especially the secret society known as "Hetæria" had agitated the movement, and in 1819 the first insurrection broke out. It was unsuccessful, as was also a revolt in Crete (1821). But the results of other uprisings were more favorable, and in 1822 the national assembly, convened at Epidaurus, adopted a provisional constitution and proclaimed their independence. The cruelty with which the Turks treated the Greek Christians and also those in Constantinople aroused the sympathies of civilized Europe. Many individual champions appeared, among them Lord Byron. At Missolonghi the Greeks, in 1822, successfully resisted the besieging Turks, but in 1826 the town was captured. The struggle was decided by the naval battle of Navarins (October, 1827), in which the Turkish-Egyptian fleet was annihilated by the combined fleets of England, France, and Russia. Count Capo d'Istria, a Greek statesman in the service of Russia, was chosen president, 1828. He was assassinated in October, 1831. The Powers undertook the settlement of the distracted

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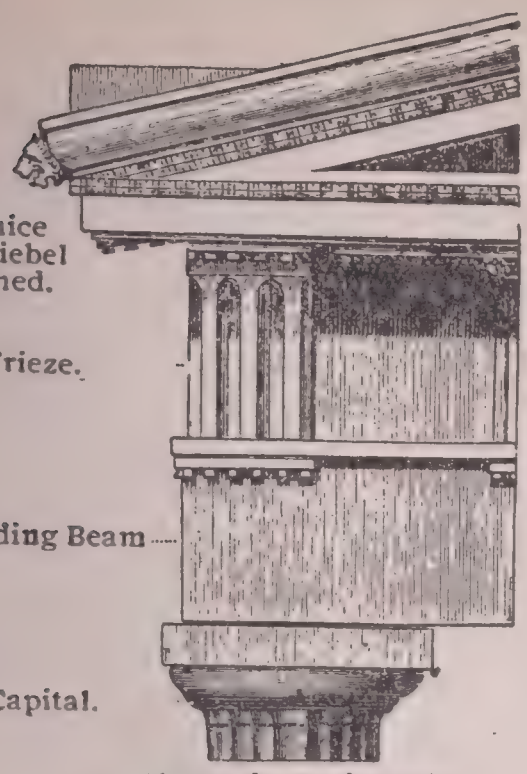
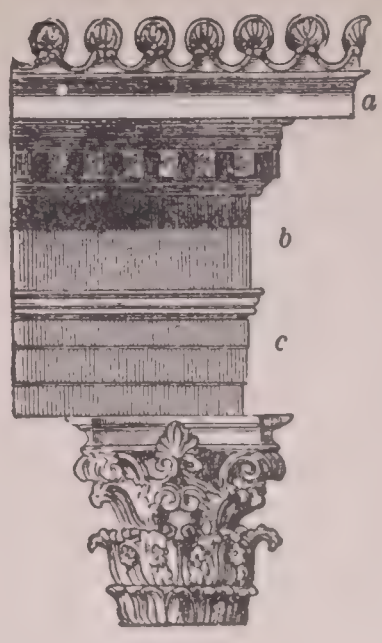
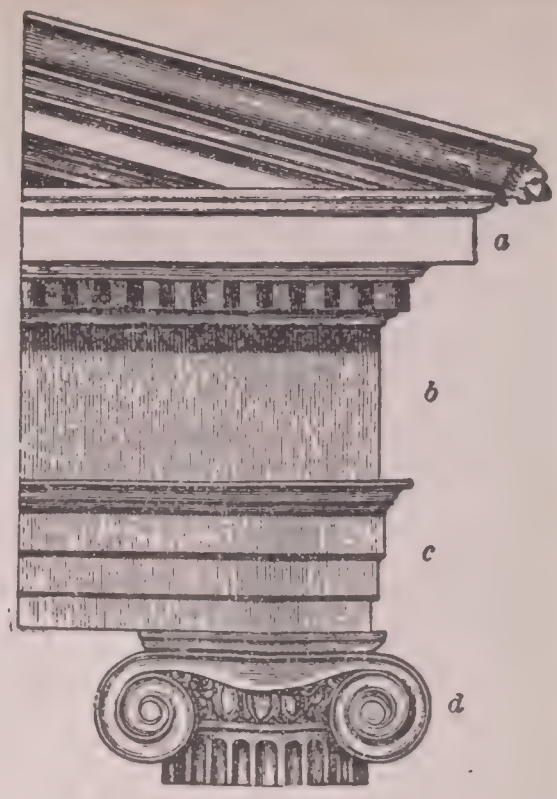
affairs of Greece, and first selected Prince Leopold of Belgium as sovereign, but owing to disputed boundaries he finally rejected the offer. Otho, second son of the king of Bavaria, was next chosen, and he became king of Greece in 1832, reigning 30 years. A constitution had not been formally promised, but was expected by the Greeks, and while Otho's rule was not despotic, the condition of the government and the possibility of future danger caused great dissatisfaction. In September, 1843, the army and the people surrounded the palace and demanded a constitution. The king yielded without violence, and in March, 1844, the constitution went into effect. The history of the next few years is marked by violent political contests and insurrections. In 1847 a diplomatic misunderstanding threatened to cause war with Turkey, and the next year serious differences arose with England growing out of certain claims of British subjects against Greece. In January, 1850, a British fleet blockaded the Piræus, and Greece was forced to yield to England's demands. In 1853 a disastrous earthquake destroyed much life and property. In the Crimean War (1853–56) Greece took the part of Russia and would have aided her, had not the threats of France and England prevented. Again the Piræus was guarded by English fleets, which in spite of many protests remained until 1857. The feeling against England grew more bitter during the agitation for the annexation of the Ionian Islands (1859–61), which had long been a British protectorate. Greece was alone restrained by the futility of undertaking war. By 1861 King Otho had become very unpopular, and even his promise to adopt a series of popular measures (January, 1862) failed. Finally a revolution broke out (Oct. 22, 1862) in Athens which was at once successful. A provisional government was established, King Otho declared deposed, and a national assembly convened. On returning from a voyage to the Peloponnesus, Otho received the news at Piræus. After a council of the diplomatic representatives, held on board his ship, King Otho issued a proclamation taking leave of Greece, and without having gone ashore sailed away to Germany (October 24). An election for a new king by universal suffrage having been ordered (December 1), Prince Alfred of England was chosen by a large majority, but was withdrawn because of an international agreement that no prince of any of the three protecting powers — England, France, and Russia — should rule Greece. The national assembly met at Athens, December 22, confirmed the deposition of Otho (Feb. 16, 1863), and unanimously elected Prince George of Denmark (March 30). The Powers confirmed the election (July 13), and King George took the oath of office Oct. 31, 1863. According to the agreement made by England, the Ionian Islands were annexed to Greece (November, 1863). In the Cretan revolution of 1866, Greece materially assisted her fellow Christians with blockade runners and by giving refuge to more than 30,000 fugitives from Moslem cruelty, and



1. Frame in Doric Style.



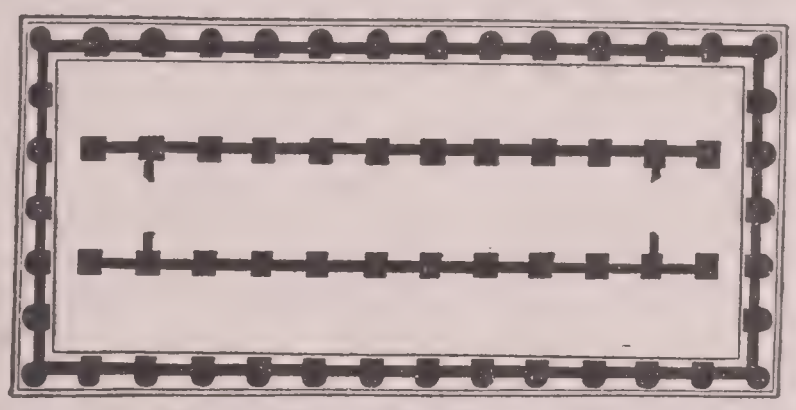
2. Frame in Corinthian Style.



3. Frame in Ionic Style.

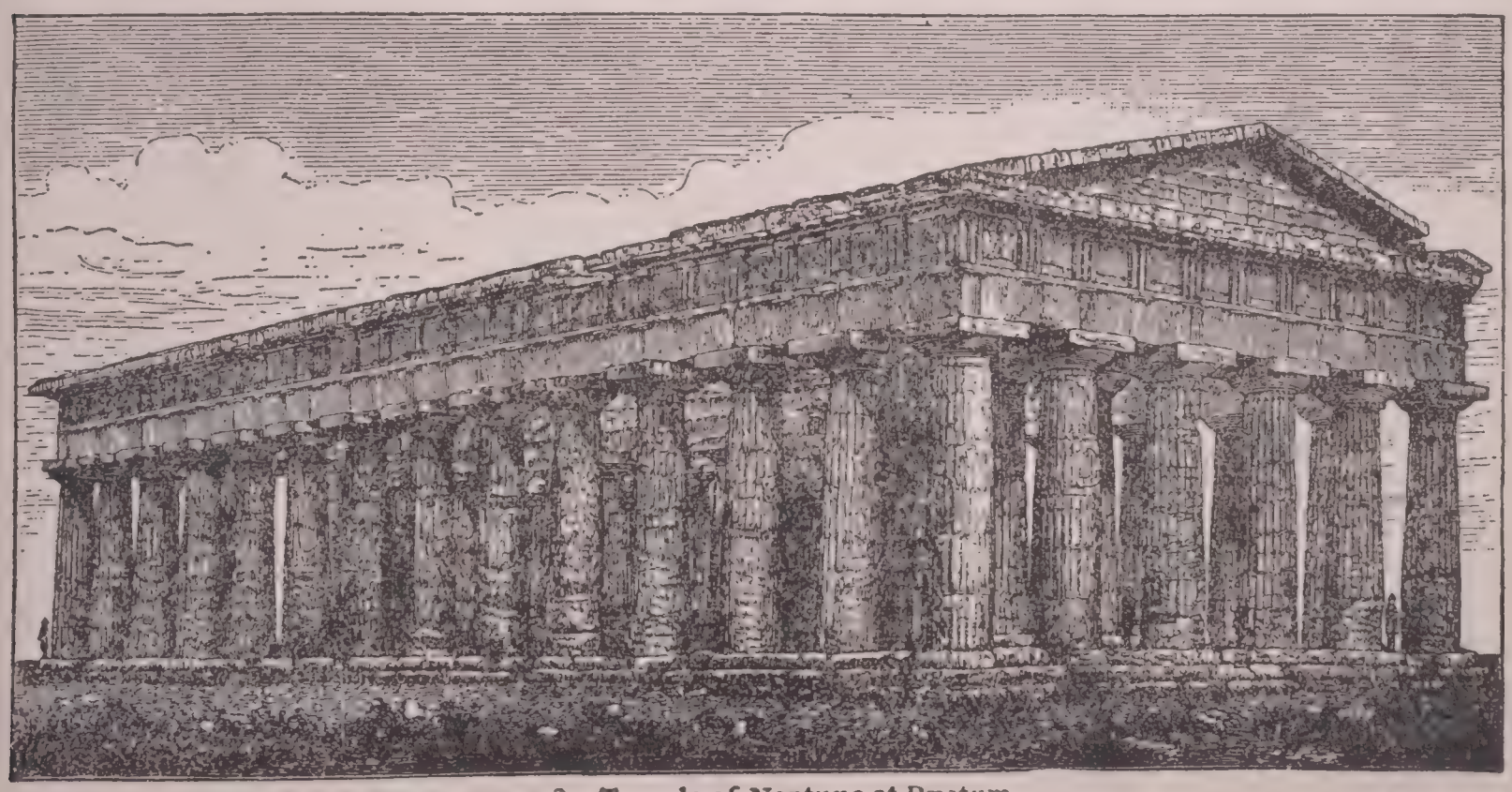
4. Monument of Lysikrates at Athens.

5. Corinthian Capital of Lysikrates Monument at Athens.



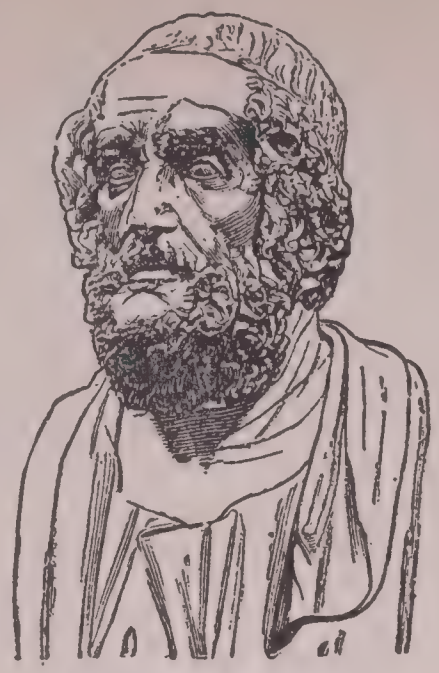
6. Ground Plan of the Temple of Zeus at Agrigens.

7. Hall at Athens.

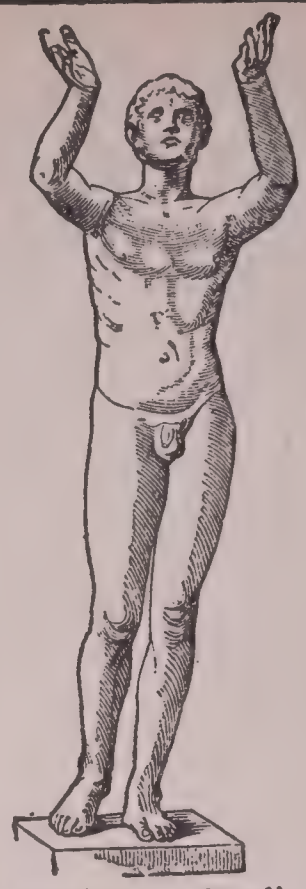


8. Temple of Neptune at Pæstum.

1. Sophocles (Rome).



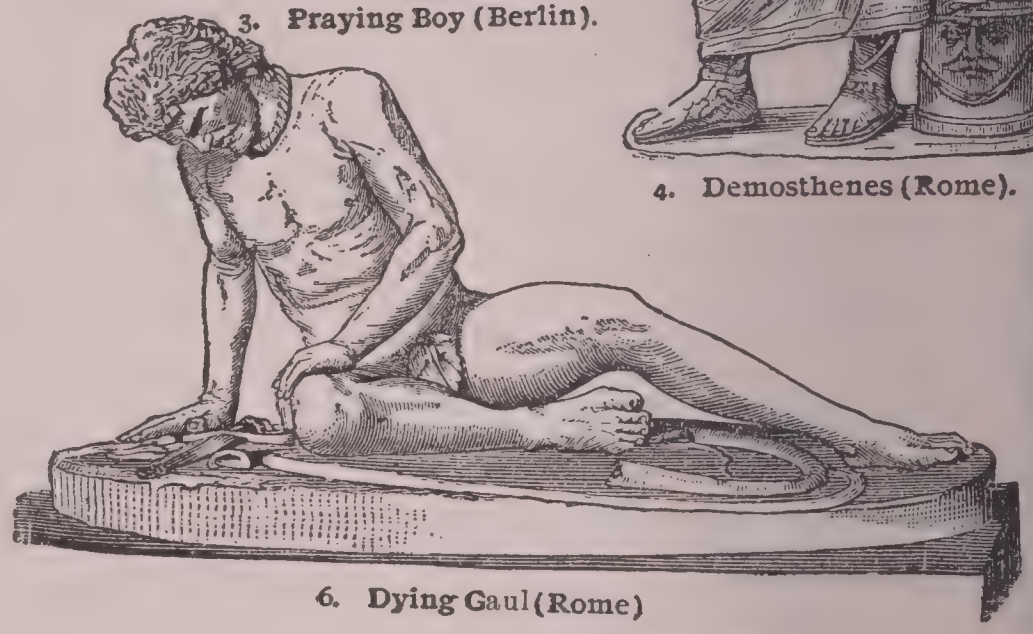
2. Homer (Naples).



3. Praying Boy (Berlin).

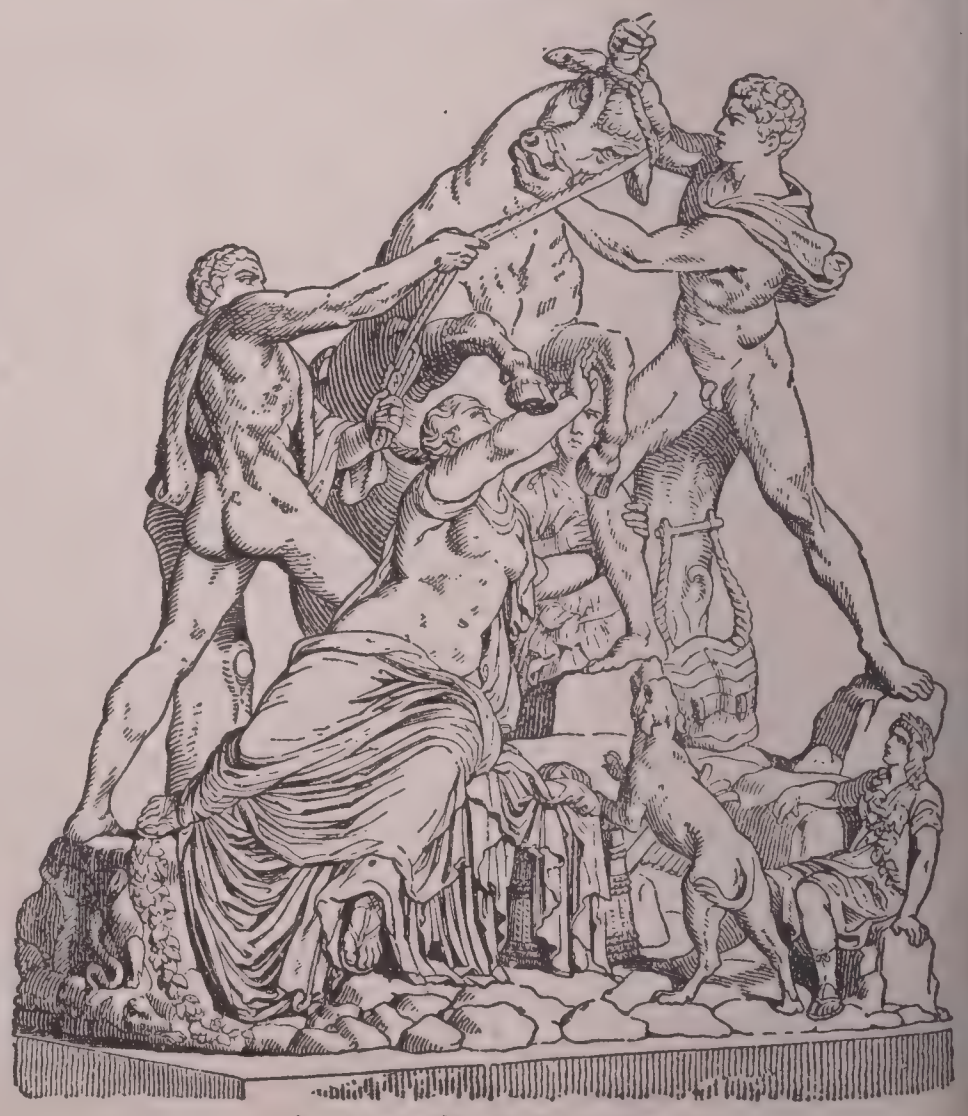
4. Demosthenes (Rome).

5. Sleeping Satyr (Munich).



6. Dying Gaul (Rome)

7. Apollo (Rome)



8. Farnesian Bull (Naples).

in consequence narrowly averted a war with Turkey. The expense of the defensive measures adopted at this time largely increased the national debt, as have the military demonstrations made at various times on the Turkish frontier, notably in 1894. The Congress of Berlin (1878) recommended the addition to Greece of Southern Thessaly and Albania. Turkey refused, and war seemed imminent, but was averted by the concession to Greece of nearly all Thessaly and part of Epirus. The embarrassed finances and the consequent dissatisfaction have led to frequent changes in the ministry and various experiments which have kept the country in a very unstable condition. In January, 1895, the proposition of the premier Trikopis to abolish certain revenue taxes, increasing the house-tax and laying a tax upon trades and professions, led to serious riots in Athens, which were quelled only by the skill of Prince George, a popular favorite. The ministry resigned and was succeeded by that of Delyannis. The public debt is about $54 per capita, and the annual charge for interest and refunding, $4 per capita. In the spring of 1896 a most interesting revival of the Olympian games, in the form of an international athletic tournament took place at Athens. In January, 1897, Greece attracted attention all over the civilized world by her championship of the cause of the Christians in Crete, who had again revolted against Turkish rule, and sought annexation to Greece. The Moslems of the island adhered to Turkey, and the contest, although political in appearance, was in fact a renewal of the struggle between Islam and Christianity. Greece at once supported the Cretan revolutionists, and an open conflict with Turkey seemed imminent when the Powers took up the question and dispatched warships to the island to prevent any open outbreak.

The origin of the war was the formal efforts of Greece to wrest the island of Crete from Turkey and incorporate it with the Greek kingdom, with which the people of the island by a large majority were in active sympathy. On the 7th of Feb., 1897, the insurgent Christians of Halepa formally proclaimed union of Crete with Greece, and a few days later a fleet of torpedo boats, under command of Prince George of Greece, was sent to Crete. The Greek reserves were also called out and dispatched to Crete. The sultan of Turkey made a protest to the powers against the action of Greece, and threatened to begin active warfare in Thessaly. The powers decided to put a stop to the invasion by Greece and sent 400 men from the Russian, British, French, and Italian fleets to Canea, in Crete. Greece was informed by the powers that unless she desisted in her efforts in Crete that the port of Athens would be blockaded. The warning was unheeded. On the 21st of February the insurgent Christians of Crete made an attack upon the Turkish forces near Canea and they would have succeeded had not three British war vessels, with others in the harbor, opened fire upon them, when the Cretans gave

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up the fight. The condition of affairs was daily growing worse, and the whole island was in a state of siege and the people were suffering for food.

Early in March the powers sent the following note to both Greece and Turkey:

"The powers have come to an agreement on the two following points:

"1. Crete cannot in any case, under present circumstances, be annexed to Greece.

"2. In view of the delays caused by Turkey in the application of the reforms agreed upon in connection with the Ottoman government, the powers are resolved, while maintaining the integrity of the Ottoman empire, to confer upon Crete an absolutely effective autonomous regime, intended to assure the island a separate government under the high suzerainty of the sultan."

The note also directed the Greeks to withdraw their forces from Crete. They were allowed six days in which to do this. The Greeks refused to obey the powers, and made a reply setting forth the claims of Greece. The powers at once tried to formulate plans for blockading Piræus and Crete but could not agree upon a plan. Fighting between the Greeks and Turks continued, and battles were fought at Malaxa, March 25, on the same date at Halepa, March 30 and 31 at Fort Izzedin, in most of which the soldiers of the powers took part against the Christian Cretans. In the meantime active preparations for war were going on in both Greece and Turkey. The Greek reserves were called out in March and appeals were sent to Greeks in the U. S. to return home and join the army. Toward the end of March a considerable Greek force of about 80,000 men had assembled on the frontiers of Thessaly, and Crown Prince Constantine left Athens to assume command. The army was formed into two divisions, having bases of supplies at Larissa and Trikhala. The porte was equally active and troops were hurried toward the Thessalian border, the headquarters of the army being established at Monastir. Edhem Pasha was in command of the Turkish forces, which numbered about 150,000 men, thoroughly equipped and armed. Turkey declared war on the 16th of April and the struggle opened at once. Both nations had their armies facing each other on the Thessalian frontier. The first severe contest began April 17 to gain the possession of a pass in the Olympian mountains near Tyrnavo, which was the gateway to the plain of Thessaly. The fighting lasted for three days, each side claiming the victory. The Turks captured every place except the ridge commanding Tyrnavo and a few days later that place fell into their hands, with large quantities of supplies and ammunition. The Greek headquarters were located at Larissa, a place about ten or twelve miles south of Tyrnavo. The Turks attempted this place next but were repulsed with loss. A few days later, however, the Turks captured Tyrnavo, and on the 25th of April the Greeks retreated from Larissa, abandoning war materials, sup-

plies, and guns. The naval efforts of the Greeks were more successful. Prevesa was bombarded, Epirus was captured and the squadron in the Gulf of Salonica captured a large quantity of Turkish stores. April 27th the Greek advanced toward Janina, reported large captures of war materials and supplies, but the Turks assumed the offensive and the advance was checked.

At the end of April and the beginning of May the center of hostilities was about Valestino, and on the 30th of April a bloody battle was fought, when a Turkish attack with 14,000 troops upon General Smolenski, with 12,000, was repulsed, with heavy Turkish losses. On May 2nd the Turks made another assault on the Greek position, but failed. May 5th a force of 50,000 Turks made an attack upon 23,000 Greeks at Pharsalos and the latter were forced to retreat. The position was now such as to satisfy the Greeks that the Turks had enough men to cut the Greek line between Bolo and Pharsalos, outflank the Greek army and force it to surrender. May 5 the Greeks evacuated Pharsalos, and retired some 13 miles south. Bolo had been practically abandoned on the 30th of April.

By May 5 the Greeks were convinced that it was hopeless for them to continue the struggle, and on the 8th of May the government informed the powers that the Greek army would be recalled from Crete. The powers requested an armistice from the porte, but he declined an armistice until the following principal conditions were accepted: Annexation of Thessaly; an indemnity of $43,936,000; abolition of the treaties conferring privileges on Greeks in the Ottoman empire; and a treaty of extradition with Greece. The porte was induced to withdraw his conditions, and an armistice for seventeen days was concluded on May 20. A treaty was concluded in September. The frontier between the two nations was fixed by the treaty, Turkey getting possession of the passes and strategic points, so that physically Greece lies at the mercy of Turkey in case of further trouble. The second provision is the indemnity to be paid by Greece. This will amount to $15,000,000, to be paid out of the revenues and to be guaranteed by the powers. In addition it will have to pay interest on some old bonds held in Germany, which Greece hoped to escape.

Language and Literature.—The Greek language is a member of the Aryan or Indo-European family, its various dialects constituting the Hellenic group. It is believed to be an elder sister of Latin, a younger sister of Sanscrit. It was probably spoken at least 1,500 years before our era by the Greeks in Europe and Asia Minor. Colonization and conquest extended its territorial limits in Western Asia, Northern Africa, and along the Mediterranean coast of Europe. The fact that Greece was the seat of classical learning, the source of philosophy and letters, and later the center of Christian teaching, made Greek in the early centuries of our era a universal language among the cultured classes, just as Latin afterward became the medium of international communication. During the Dark Ages Greek was little known to Western Europe, although it remained the language of the Byzantine Empire. The emigration of the Greeks to Italy after the fall of Constantinople and during the century preceding, gave a new impetus to the study of the Greek language, and the revival of learning gave it the place it has ever since occupied. The introduction of Greek as a study at the university of Cambridge in 1510 is inseparably linked with the name of Erasmus. Of Greek in its earliest common form no literary monument remains. The three dialects in which it appears are designated Doric, Æolic, and Ionic. The Doric was spoken chiefly in Northern Greece, the Peloponnesus, Crete, and the various colonies; Ionic in Attica and Asia Minor. Of the former, Pindar and Theocritus are the chief literary representatives. Ionic is commonly divided into three stages: the old Ionic, or epic, in which the poems of Homer and Hesiod are written; the new Ionic, the dialect of Herodotus; and the Attic, in which most of the masterpieces of Greek literature are written. The pre-eminence of Athens in the world of politics and of letters made its dialect the standard. The several dialects differed chiefly in pronunciation and inflectional endings, but little in essential structure. During the centuries following the classical period, Greek underwent changes due to the usual internal modification and corruption and to contact with other languages. Modern Greek has, however, preserved the integrity of the written language to a remarkable degree, so that the student of classical Greek can read "Romaic," as it is sometimes called, with little difficulty. The spoken language varies considerably, at least from the commonly accepted standard of pronunciation of the ancient tongue. Classical Greek is marked by a wonderful beauty and elasticity of syntactical structure, and is less mechanical, perhaps also less exact, than the Latin. As compared with Latin, its legacy to our language has been small, less than one ninth of the modern English vocabulary being of Greek origin, while nearly one half may be traced back to sources originally Latin.

The names preserved to us from the literature of ancient Greece are not many, but they are so important, so manifestly a part of the world-literature, that their treatment is reserved for individual articles. Here will be given, therefore, a mere outline, an index to Greek literary history. Pagan Greek literature, as it is called, came to an end with the closing of the Athenian schools by the Emperor Justinian (527–65), and during the remaining period of the Byzantine Empire original productions were exclusively of a Christian character. Noteworthy are the writings of the Christian Fathers. The literature of modern Greece has not been of sufficiently universal interest to find an audience beyond the narrow limits of the native language, and will,

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therefore, not be treated here. Only on occasions of great national movements have the later Greek poets struck chords that echoed beyond their boundaries, as when just before the nineteenth century wars of liberation Constantine Rhigas wrote his celebrated imitation of the *Marseillaise*, which has become the national hymn. Classical Greek literature falls into three periods: the first extends to 475 B. C.; the second is the Attic or Golden Age, 475–300 B. C.; the third is the so-called Alexandrian Age, 300–146 B. C. The earliest preserved monuments of Greek poetry are the *Iliad* and the *Odyssey* of Homer, of which both date and authorship have been matters of dispute. More than a century later came Hesiod, the poet of nature and of real life among the lowly. His longest poem is the *Works and Days*, an epic containing minute directions for the farmer, as well as reflections upon industry, morality, and justice, interspersed with many homely maxims. On it is based the *Georgics* of Virgil. Hesiod's *Theogony* gives a genealogy of Greek gods and heroes. The latter part of the first period is the earliest age of Greek lyric poetry. Of these are to be mentioned Alcæus, to whom Horace was indebted, and the poetess Sappho, whom the Greeks placed next to Homer. The mere fragments of her poetry that remain are marvelously beautiful. The courtier Anacreon sang of love and wine, and from him the poems of later times dealing with these subjects are called *Anacreontics.* But greatest of all, perhaps greatest of lyric poets in all time, is Pindar, whose odes have inseparably connected his name with the Olympian games and other great festivals of Greece. The literature of the Golden Age was the product of the times. It was the echo, the reflection which inevitably appears coincident with the political glory of a nation. Of all the forms which Attic literature took, the drama, history, and oratory are the most characteristic and important. Conditions were most favorable to the composition and production of great dramatic works, and in the Age of Pericles they reached their highest perfection. Greek drama had its origin in religious festivals, and as such received the sanction and support of the state. Performances were given during the festivals in honor of Dionysus—the Greek Bacchus—and were attended by all classes and ages, although women are said to have been generally excluded from comedy. The theaters were immense semicircular structures under the open sky, with rising tiers of seats, and were usually built into a hillside. The largest—in Athens—held 30,000 persons. The plays were presented in rapid succession from morning till night, and the performances were usually occasions of contests between rival poets. The stage machinery was elaborate, as were also the costumes. Actors wore masks; female parts were taken by men. A feature of the Greek drama was the chorus, which performed certain dances and sang odes relating to the events passing on the stage before them. It was from the choral dances that the drama originated, there being first introduced mere recital, or monologue; then dialogue was employed, and finally a third actor was added, three being the most that appeared on the stage at the same time (the chorus excepted) in the classical drama. The subjects of Greek tragedy were mythological and legendary, tales of the gods and heroes of the past. The all-prevailing idea was the "Doctrine of Nemesis," the inevitable avenging of man's presumption and overweening pride through his own acts of folly. The three poets to whom Greek tragedy owes its immortality are Æschylus, Sophocles, and Euripides.

Greek comedy is just as inseparably identified with the name of Aristophanes. The next in importance of the comic poets was Menander, whose plays were favorites with the Romans. The first great historian of Greece was Herodotus, the "Father of History." The groundwork of his delightful book is the Persian wars. Thucydides was the author of a most valuable *History of the Peloponnesian War.* Xenophon is known the world over by his *Anabasis* and his *Memorabilia*, or *Recollections of Socrates.* His other works are the *Hellenica*, and the historical romance called *Cyropædia*, a life of Cyrus the Great. The fact that the Greeks, and especially the Athenians, enjoyed free speech to such a remarkable degree, and had the right to be heard in public debate upon political questions, gave great encouragement to the study and practise of oratory, and brought it to the unparalleled perfection which it attained in Greece. Every man who wished to become a leader in Athenian affairs must be an orator, and hence the famous statesmen. Themistocles and Pericles were also noted orators, and to this fact largely owed their power and influence. They are, however, known chiefly as statesmen, although an oration of Pericles is preserved in the history of Thucydides. The greatest of the Greek orators was Demosthenes, whose name is the synonym of the art in its perfection. Linked with his name is that of Æschines, his worthy rival, against whom the famous *Oration on the Crown* was directed. Less familiar to us, but noted in their day, were Antiphon, b. a century before Demosthenes (whose date is 385–322 B.C.), and regarded as the first of the ten Athenian orators; Lysias and Isocrates, both noted orators, the latter, however, more as a rhetorician, his discourses being usually written for others to deliver. Cicero, the greatest of the Roman orators, borrowed from and imitated Isocrates. The Alexandrian Age extends from the division of Alexander the Great's empire to the conquest of Greece by Rome (300–146 B. C.), and is so called because the city of Alexandria in Egypt, where the great museum and library of the Ptolemies were located, was the center of literary activity in that period. It is characterized by imitative and critical writing rather than by original creative genius, and is therefore the period of grammarians and commentators. The most important production of the age was the translation of the Old Testament from

Hebrew into Greek. It is said to have been made by seventy scholars, and is therefore generally known as the *Septuagint.* The only poet worthy of mention is Theocritus, whose *Idylls* are the most beautiful pictures of pastoral life ever written. His reproductions of Sicilian peasant life have been models for idyllic poets ever since. The charming delicacy and pathos of Theocritus echo the joys and woes of human nature as accurately as his brush paints the skies of Sicily and the fields and flocks amid which his rustics dwelt. If the productions in the domain of pure literature were few, the Alexandrian Age was rich in scientific investigation and results. Here belongs the famous mathematician Euclid, whose work is the basis of the science of geometry until this day. At Syracuse in Sicily dwelt Archimedes, the greatest scientist and mathematician of the Greek world, and the author of various works relating to physics. In the sciences of astronomy and geography, the names of Aristarchus, the forerunner of Copernicus, in the theory of the solar system; Eratosthenes, who determined approximately the circumference of the earth by studying the sun's shadow; Hipparchus was the founder of scientific astronomy. Later scientists are Strabo (50 B. C.) who traveled over most of the known world and gave a most valuable account of all he saw; Claudius Ptolemy (150 A. D.), the most famous of ancient astronomers, whose great work compiled and handed down all the scientific knowledge of his time. This fact probably, rather than his original genius, has made his fame, and the phrase *Ptolemaic System* links to him the credit for the solar system theory, which prevailed for fourteen centuries, until Copernicus. Ptolemy believed the earth to be a globe, but would not accept Aristarchus's theory of its rotation and revolution. In medicine Hippocrates (b. 460 B. C.) had laid the foundations of a science and had earned the title "Father of Medicine." Galen (130–193 A. D.) wrote a vast number of medical works, greatly valued throughout the Middle Ages. The period of Greek literature following the Alexandrian Age is designated the Græco–Roman Period (146 B. C.–527 A. D.), during which Rome was the center of Greek literary activity. Here belong the valuable history of the Roman conquests of Polybius, which is preserved in fragmentary form; a *General History of the World,* with Rome as the central figure, by Diodorus Siculus. The book best known to modern readers is the *Parallel Lives* of Plutarch (b. 40 A. D.), the "prince of biographers." His work contrasts Greek and Roman statesmen and soldiers and shows everywhere a desire to recall with patriotic pride the days of his country's vanished greatness. In Greek philosophy the early names of note are Pythagoras among whose many interesting theories were the "music of the spheres" and the transmigration of souls, the latter idea probably brought from Egypt. Following him were Anaxagoras who recognized *mind* as the ruling power of the universe, and Empedocles and Democritus, some of whose speculations were not very different from accepted doctrines today. The famous Sophists, among them Protagoras, Gorgias, and Prodicus gave instruction in rhetoric and the art of disputation. Then came the three great philosophers and teachers whose names are the synonyms of wisdom, Socrates, Plato, Aristotle. The science of philosophy, so ably founded, was later carried on by various schools in different directions. The three prominent schools with which are always associated the names of their leaders are: Zeno, and the Stoics; Epicurus, and the Epicureans; Pyrrho, and the Skeptics. Then came the Neo-Platonists, whose memorable conflict with Christianity marks the reign of the Roman emperor, Julian the Apostate (361–363 A. D.). For the religion of Ancient Greece, see *Mythology.*

In architecture, sculpture, and painting, especially in the first two, Greece attained a remarkable degree of perfection. In all their art, beauty and moderation—"nothing in excess"—were the chief maxims. The three orders of Greek architecture, principally distinguished by the differences in proportion and ornamentation of the column, are the Doric, the Ionic, and the Corinthian, of which the first is most simple, the last most elaborate. See *Architecture.* The most famous specimen of Greek architecture of which the ruins survive, is the Parthenon at Athens. In sculpture the most famous names are Phidias, whose masterpieces were the statue of Athena in the Parthenon, and that of Olympian Zeus; Polycletus; Praxiteles, the sculptor of "Eros" and "Hermes;" Chares, who wrought the Colossus of Rhodes. The celebrated group of the Laokoön was probably the work of three Rhodian sculptors, Agesander, Athenodorus, and Polydorus. Among the painters of Greece are to be mentioned Zeuxis and Parrhasius, and Apelles, the "Raphael of antiquity."

Greek Church.—The church of the countries formerly comprised in the Greek, Eastern, or Byzantine Empire and of the countries converted to its teachings, as Russia. Its official name is "the Holy Orthodox Catholic and Apostolic Church," the word "Orthodox" being especially emphasized by its adherents. The so-called Greek Church is now divided into three distinct branches: 1, The Orthodox Church in the Turkish Empire, subject to the patriarch of Constantinople, who is under the protection of the sultan and has a certain official civil rank, but the latter reserves to himself the right to appoint and depose the patriarch at will. At Alexandria, Jerusalem, and Antioch are subordinate patriarchates. 2, The Orthodox Church in Russia, under the Holy Synod of St. Petersburg and primarily the czar, who is the recognized temporal head of the whole Greek Church. The Russian Church was formerly under a metropolitan, but in the seventeenth century it was made a patriarchate, dependent, however, upon Constantinople. Peter the Great, early in the eighteenth century, formally separated the Russian Church, it being first governed by a patriarch, later by the Holy Synod. 3, The

National Church of Greece, established under a Holy Synod since 1833, but more independent of the state than the Russian Church. The so-called "United Greek Church," in Austro-Hungary, Southern Italy, Poland, and parts of Russia conform in some respects to the Greek rites, but acknowledge the supremacy of the Roman pontiff. The separation of the Greek and Roman churches is closely connected with the division of the Roman Empire into Eastern and Western. The rise of Constantinople and the growing jealousy and rivalry in Church and State made a continued condition of dependence impossible. The insertion of *filioque* ("and from the Son") by the Latin Church in the Nicene Creed and the question of papal supremacy caused constant discord. In the latter part of the ninth century began the so-called Great Schism, but the final division did not formally take place until 1054. Besides doctrinal differences, the war of the Iconoclasts, or "image-breakers," contributed not a little to the discord, the patriarchs frequently supporting those who sought to destroy the images of the Latin Church. The conduct of the Latin princes at Constantinople during the Crusades and the establishment of the Latin kingdom there made the breach irreparable, although the later rulers of the Byzantine Empire strove, from political motives, to effect a reconciliation. Ineffectual attempts were made to secure the adherence of the Greek Church in the period of the Protestant Reformation, first by Melanchthon, later by a formal Lutheran embassy. In the following century the patriarch Lucaris, who was in sympathy with the Calvinistic doctrines of the West, tried to carry his fellow churchmen with him, but failed signally. As recently as 1869 a correspondence took place between the archbishops of Canterbury relative to a union of the Anglican and the Greek churches. In general the doctrines of the Greek Church are not essentially different from those of the Roman Catholic, except with respect to the *filioque*, i. e., the double procession of the Holy Ghost, both from God the Father and God the Son. This dogma, common to Roman Catholics and Protestants alike, the Greeks do not accept. While denying papal supremacy, they accept not only the Bible but also the traditions of the Church and later apostolic testimony as the rule of faith. They admit the seven rites of the Roman Church, viz., baptism, confirmation, eucharist, penance, extreme unction, holy orders, and matrimony, but with considerable variation in their observance. Baptism consists of a triple immersion, and confirmation follows it immediately even in the case of infants; the latter may be administered by priests. In the eucharist, the Greeks admit the real presence of Christ, the transubstantiation of the elements, and the adoration of the host. They use leavened bread, give communion in both kinds, to adults and children alike. They recognize confession, priestly absolution, and the applicability of indulgences but to the dead only. The same honor is paid to relics as in the Roman Church; pictures are adored, but no graven image, except the cross, is permitted. Fast periods and days are numerous; from Pentecost to the day of St. Peter and St. Paul and six weeks before Christmas, in addition to the usual Lenten fast; also all Wednesdays and Fridays. They believe in the intercession of saints, and especially of the Virgin Mary. Instrumental music is forbidden in the service, but singing is universal. In public prayer—except at Pentecost—they stand, with the face toward the east. Their ceremonial is formal and splendid. On the matter of celibacy, the ordinary secular clergy are generally required to marry before taking orders, but may not as priests or deacons. They are prohibited from marrying a widow, and may not themselves remarry. Bishops are forbidden marriage and hence are chosen from the monastic orders and never the secular clergy. As to matrimony in general, the tie is regarded as dissoluble in case of adultery. The monastic institute has always existed in the Greek Church; convents are numerous. The total membership of the Greek Church is estimated at 84,000,000, of whom about 55,000,000 are in the Russian Empire.

Greek Fire, an inflammable and destructive compound used in mediæval warfare, especially by the Byzantine Greeks. It was poured from cauldrons and ladles, vomited through long copper tubes, or flung in pots, phials, and barrels. The art of compounding it was concealed at Constantinople with the greatest care, but it appears that naphtha, sulphur, and niter entered into its composition.

Greeley, Horace (1811–1872), American journalist and politician; worked first on a farm, then as a compositor. In 1831 he went to New York, where, after an unsuccessful attempt to start the *Morning Post*, the first penny paper, he commenced in 1834 to issue the *Weekly New Yorker*, which ran for seven years. *The Log Cabin*, another weekly, established by him in 1840, reached a circulation of 80,000, and gave him a reputation which ensured the success of his *Daily Tribune*, founded in 1841, and edited by him till his death. In 1848 he was elected to Congress. In 1851 he visited Europe, and was one of the jurors in the Great Exhibition. He opposed the Civil War, but was a firm supporter of the Union and of President Lincoln, and at the close of the war advocated a general amnesty and universal suffrage. In 1872 he was nominated for the presidency in opposition to General Grant, but was defeated. The strain of electioneering and the death of his wife brought on an illness of which he died a few weeks later. Chief among his miscellaneous works are his *Hints Toward Reforms* (1850), *Glances at Europe* (1851), *History of the Struggle for Slavery Extension* (1856), *The American Conflict* (1864), *Recollections of a Busy Life* (1869).

Greely, Adolphus W., b. at Newburyport, Mass., 1844. He was a volunteer in the Civil War and was made captain. In 1868 he was placed on the Signal Service and in 1881 conducted an expedition sent to the Arctic re-

gions. He and six survivors were rescued in 1884 by a relief party under Commander Schley. In 1886 he published *Three Years of Arctic Service*, and in 1887 he was made chief of the Signal Service. In 1888 he published *American Weather*, and in 1893, *American Explorers and Travelers.*

Green, JOHN RICHARD (1837–1883), historian. For some time he wrote constantly for the *Saturday Review;* but he was comparatively little known until the publication in 1874 of his *Short History of the English People*, which secured him immediate fame. It was by a larger edition of the same work entitled *A History of the English People* (1877–80), a volume of *Stray Studies from England and Italy*, and *The Making of England* (1882), that he became best known.

Greenbacks, the popular name given to the paper currency first issued by the U. S. government in 1862 during the Civil War. It is sometimes used also to include U. S. bank notes.

Green Bay, Brown co., Wis., on Fox River, at the head of Green Bay, 113 mi. n. of Milwaukee. Railroads: C. & N. W.; Milwaukee Northern; G. B. W. & St. P. Has a good harbor. Here are located extensive breweries, sawmill, cooperage works, soap factory, flour and planing mills, and cigar factories. It exports manufactured goods, grain, fish, and lumber. Pop. 1900, 18,684.

Green-brier, a popular name in the U. S. for a very common thorny climbing shrub, having a yellowish-green stem and thick leaves, with small bunches of flowers.

Greenbush, Rensselaer co., N. Y., on Hudson River, opposite Albany. Railroads: Boston & Albany, and N. Y. C. & H. R. It has sawmills, pork-packing establishments and railroad machine shops.

Greene, NATHANIEL (1742–1786), a general of the American revolutionary army, b. at Potowhommet, R. I. In 1770 he was elected to represent Coventry in the general assembly of Rhode Island, and was soon after excommunicated by the Quakers for taking arms on the prospect of war with Britain. In 1774 he joined the Kentish Guards as a private, and in May, 1775, he was appointed brigadier general and commander of the Rhode Island contingent in the army before Boston. He gained at once the confidence of Washington, was made major general, and appointed to the command in New Jersey. At Trenton (1776) and Princeton (1777) he led a division, and in the subsequent fighting he held important commands, and repeatedly distinguished himself. In 1778 he was quartermaster general, and in 1780 presided at the trial of Major André. In the same year he was appointed to the command of the southern army, and succeeded, after repeated defeats, in wresting Georgia and the Carolinas from the British.

Greene, ROBERT (about 1560–1592), British dramatist; studied at Cambridge, and took his degree of B. A. in 1578, after which he traveled on the Continent. His works consist of plays, poems, tales, and tracts. His chief romances are *Pandosto* (1588), *His Groat's Worth of Wit Bought With a Million of Repentance* (1592), is remarkable for the allusion to Shakespeare, "an upstart crow, beautified with our feathers." His *Pandosto* furnished the basis for Shakespeare's *Winter's Tale.*

Greenfield, Franklin co., Mass., on Connecticut River, 36 mi. n. of Springfield. Railroad, Boston & Maine. Industries: silver works, sterling goods, machine shops, flouring mill, iron foundry, shoe, rake, and other factories. Surrounding country agricultural. The town was first settled in 1663, as a part of Deerfield, and was incorporated in 1753. Population 1900, 7,927.

Greenfinch (Green Linnet, or Green Grosbeak), a bird of the finch family, and one of the most common of British and European birds. It frequents hedges, gardens, and small plantations, and feeds on grain, seeds, or insects. Its song is not melodious, but it easily becomes tame. The general colors of the male are green and yellow, those of the female inclining to brown.

Green Gage, a variety of the plum, the *reine claude* of the French, well known in the U. S., introduced into Britain by a person named Gage. It is large, of a green or yellowish color, and has a juicy, greenish pulp of exquisite flavor.

Greenheart, a tree of the nat. order Lauraceæ, a native of Guiana, called also the *bebeeru.* Its wood is hard and durable, and is used in shipbuilding, not being liable to attacks from the Teredo. The bark contains the alkaloid bebeerine.

Greenhouse, a building constructed chiefly of glass for the preservation of delicate plants. A greenhouse is sometimes distinguished from a hothouse by not requiring artificial heat during summer, and from a conservatory in having the plants in pots and not in the ground. The lean-to form, in which advantage is taken of a house or garden wall as a support, is frequently used, but the growth of plants in such houses is one-sided, and the span or arch-roofed structures, with glass on all sides, are to be preferred. The materials used are chiefly glass, wood, and iron.

Greenland (Danish and German, *Grönland*), an extensive island belonging to Denmark, situated on the northeast of the continent of North America, from which it is separated by Davis's Straits, Baffin's Bay, and Smith's Sound. Great part of its northern and precipitous eastern coast is yet unknown; but it does not extend farther north than about lat. 83°. Like the northern parts of North America generally, Greenland is colder than the corresponding latitudes on the east side of the Atlantic. In June and July the sun is constantly above the horizon, the ice on the coast is broken up and floats southward, and a few small lakes are opened; but the short summer is followed by a long and dreary winter. The interior, which is lofty and has the appearance of one vast glacier, is uninhabitable, and all the villages are confined to the coasts, which are lined with numerous islands, and deeply

penetrated by fiords. The Danish colony extends north, on the western coast, to the Bay of Disco, in lat. 69° n. Cultivation is confined to the low shores and valleys, where grassy meadows sometimes occur with stunted shrubs and dwarfed birch, alder, and pine trees. Attempts to raise oats and barley have failed, but potatoes have been grown toward the southern extremity. Turnips attain the size of a pigeon's egg, and cabbages grow very small. The radish is the only vegetable which grows unchecked. The inhabitants are largely dependent upon hunting and fishing. Whale blubber and seal oil are used as fuel. Despite the proximity of America the flora and fauna are rather of a European character. The land animals are the Eskimo dog, the reindeer, the polar bear, the Arctic fox (blue and white), the ermine, the Arctic hare, and the musk ox. Among the amphibia the walrus and several species of seal are common. The seas abound in fish, the whale and cod fisheries being of special importance. Sea fowl are abundant in summer, and largely killed. The chief mineral product is cryolite, but graphite and miocene lignitic coal are also found. Oil, eider down, furs, and cryolite are exported. The population, which is chiefly Eskimo, numbers 9,780. For administrative purposes Greenland, or rather its coast, is divided into two inspectorates of North and South Greenland. The residences of the inspectors are at Disco Island and Godhaab, but the most populous district is Julianshaab (pop. 2,200).

Greenland was discovered by an Icelander named Gunnbjörn about 876 or 877. It was colonized from Iceland about the end of tenth century, and other Scandinavians followed. In 1264 it was politically united with Norway, and about the middle of the fourteenth century possessed two flourishing colonies on the west coast, named West Bygd and East Bygd. These settlements, however, gradually disappeared from history, and the expeditions sent by Denmark in 1585, 1606, 1636, 1654, and 1670 for the purpose of finding the colony were unsuccessful. Various relics, inscriptions, etc., have been found. In the reign of Elizabeth, Frobisher and Davis rediscovered the coast, but nothing was done to explore it until the Danish government in 1721 assisted Hans Egede, a clergyman, to establish a European mission settlement, Good Hope, which was successfully carried on by him and his son. Whale fisheries were established on the coast by the English and Dutch about 1590. The interior of the country was first crossed from east to west by Nansen in 1888.

Green Mountains, a mountain range, U. S., commencing near New Haven, Conn., and extending n. through Massachusetts and Vermont, between Lake Champlain and the Connecticut River. The highest summits are Mansfield Mountain (4,279 ft.) and Camel's Hump (4,188 ft.), both in Vermont.

Greenock, a parliamentary burgh and seaport town of Scotland, county Renfrew, on the southern shore of the estuary of the Clyde. The manufactures include numerous sugar

refineries, shipbuilding yards, iron foundries, and machine establishments, chemical works, worsted, woolen, and paper mills; grain, saw, and sundry other mills; jute and bagging factories, roperies, and sail-making establishments. Greenock carries on a considerable coasting and foreign shipping trade, especially with East and West Indies, America, and Australia. The docks are spacious and possess every accommodation for shipping, including five graving docks, hydraulic and steam cranes, etc.; and the harbor accommodation is being increased. Large numbers of vessels unload at Greenock and ascend to Glasgow for cargoes. Pop. 63,498.

Greenough, Horatio (1805–1852), sculptor, was b. in Boston, Mass. Graduated from Harvard in 1825, at that time making the design from which Bunker Hill monument was constructed. His works were mostly produced in Italy, and are highly prized. His colossal statue of Washington is among the most important.

Green River, Ky., flows generally w. and n.w., and enters the Ohio 200 mi. below Louisville. It is navigable for boats for about 200 mi.

Greensand, a name common to two groups of strata, occurring in the s.e. of England, the Isle of Wight, etc., the one (lower greensand) belonging to the lower cretaceous series, the other (upper greensand) to the upper cretaceous series; between them is the clay called the gault. They consist chiefly of sands, with clays, limestones, and chert bands. In New Jersey it is known as *marl*, and is used as a fertilizer.

Green Tea, a tea of a greenish color. The green color should be due to the mode in which the leaves of the tea plant are treated in the process of drying.

Greenville, Darke co., O., 35 mi. n.w. of Dayton. Railroads: C. St. L. & P.; C. C. C. & St. L.; and C. J. & M. Is is a grain-raising district; has saw mills, carriage and wagon shops, etc. Pop. 1900, 5,501.

Greenville, Washington co., Miss., on Mississippi River, 100 mi. n.n.w. of Jackson. Railroads: L. N. O. & T.; and Rich. & Danv.; has saw mills and oil works. Ships large quantities of cotton. Pop. 1900, 7,642.

Greenville, Butler co., Ala., 45 mi. s. of Montgomery. Railroad, Louisville & Nashville. Industries: Cedar factory, iron foundry, rice and corn mills. Surrounding country agricultural. The town was first settled in 1818 by a colony from South Carolina, and became a city in 1880. Pop. 1900, 3,162.

Greenville, Greenville co., S. C., on Reedy River. Railroads: Car. Knox & W.; Rich. & Danv. Seat of Furman University, and several other educational institutions. Has cotton factories, and is an important cotton market. Pop. 1900, 11,860.

Greenwich (grēn'ich), a parliamentary borough of England, county Kent, on the right bank of the Thames, about 5 mi. s.e. of London Bridge. It is built partly on an acclivity, but chiefly on the level ground skirting the

river. There are extensive iron foundries and engineering works, barge and boat-building yards, boiler works, mast, block, and sail works, telegraph cable works, roperies, chemical factories, etc. The object of greatest interest is the magnificent hospital, the oldest portion of which was originally a palace of Charles II. As a hospital for aged and disabled seamen of the navy, it was opened in 1705, and subsequently accommodated about 3,000. In 1865, however, it ceased to be an asylum for seamen, and is now the seat of the Royal Naval College for the education of naval officers. The celebrated observatory of Greenwich, erected by Charles II for Flamsteed, stands upon an eminence in the park. The longitude of all British maps and charts, and also of those issued by the government of the U. S. of America, as well as many of these published in other countries, is computed from this observatory, which is 2° 20′ 23″ w. from the observatory of Paris, and 18° e. from the meridian of Ferro.

Greenwich, Fairfield co., Conn., 30 mi. n.e. of New York. Railroad, N. Y. N. H. & H. Summer resort for people from New York City. Manufactures belting, woolens, tinners' hardware, etc. Pop. 1900, 2,420.

Grégoire (grā-gwär), Henri, Count, bishop of Blois (1750–1831), a churchman and statesman of the French Revolution. Although extreme in his democratic opinions, he was an unflinching Jansenist. He was a member of the Council of Five Hundred, of the corps législatif, and of the senate (1801). On the conclusion of the concordat he resigned his bishopric. He voted against the establishment of the imperial government, and alone in the senate resisted the restoration of titles of nobility. He himself afterward accepted the title of count, but in the senate was always one of the small body who opposed Napoleon, and in 1814 was one of the first to vote for his deposition. He passed the latter part of his life in retirement, and d. at Paris. He left numerous works, among them *Ruines de Port Royal*, 1801; *Essai Historique sur les Libertés de l'Eglise Gallicane; Histoire des Sectes Religieuses depuis le Commencement de ce Siècle*, 1810 and 1828; *Annales de la Religion*, 1795–1803.

Gregorian Calendar, the calendar as reformed by Pope Gregory XIII in 1582. The *Gregorian year* is the ordinary year, as reckoned according to the Gregorian calendar.

Gregory, the name of thirteen popes, of whom we need notice only the following: Gregory I (540–604), called also the Great, b. at Rome, of noble family. He became a member of the senate, and was made prefect of Rome in 573. He expended his inheritance in the foundation of monasteries and charitable institutions, and then took monastic vows himself. Pope Pelagius II sent him on an embassy to Constantinople, and afterward made him papal secretary. On the death of Pelagius, in 590, he was chosen his successor. He displayed great zeal for the conversion of heretics, sending missionaries to Sicily, Sardinia, Lombardy, England, etc., as well as for the advancement of monachism, and the enforcement of clerical celibacy. The works ascribed to him are very numerous; his genuine writings consist of a treatise on the *Pastoral Duty*, *Letters*, *Scripture Commentaries*, etc. Gregory VII (Hildebrand) (1020–1085), b. at Soana, in Tuscany; passed part of his early life in Rome, became a monk at Cluny, and then returned to Rome with Bruno on the election of the latter to the papal chair. He exercised great influence over Leo IX (Bruno) and his successors, Victor II, Nicholas II, and Alexander II; and under Nicholas II he succeeded in depriving the clergy and people of Rome of a voice in the election to the pontificate by giving the power of nomination to the cardinals alone. On the death of Alexander II (1073) he was raised to the papal chair. His chief aim was to found a theocracy in which the pope should be the sovereign ruler in political as well as ecclesiastical matters. He therefore prohibited simony and the marriage of priests (1074), and abolished lay investiture (1075), the only remaining source of the authority of princes over the clergy of their dominions. The Emperor Henry IV refused to obey this decree, and Gregory, after deposing several German bishops who had bought their offices of the emperor, and excommunicating five imperial councilors concerned in this transaction, summoned the emperor before a council at Rome to defend himself against the charges brought against him. Henry then caused a sentence of deposition to be passed against the pope by a council assembled at Worms. The pope, in return, excommunicated the emperor, and Henry, finding himself in difficulties, went to Italy, and submitted at Canossa (1077) to a humiliating penance, and received absolution. After defeating Rodolph of Suabia, however, Henry caused the pope to be deposed by the council of Brixen, and an anti-pope, Clement III, to be elected in 1080, after which he hastened to Rome and placed the new pope on the throne. Gregory passed three years as a prisoner in the castle of St, Angelo, and though finally liberated by Robert Guiscard, he was obliged to retire under the protection of Guiscard to Salerno, where he d. Gregory XIII (1502–1585) (*Ugo Buoncompagno*), b. at Bologna; created cardinal in 1565; chosen successor of Pius V in the popedom in 1572. He permitted the cardinal of Lorraine to make a public thanksgiving for the massacre of St. Bartholomew, encouraged plots against Queen Elizabeth, and incited Philip II to attack her. His foreign policy cost him much money for subsidies to excite enemies to the Turks and heretics, and his financial expedients to fill his exchequer ruined the trade and disturbed the peace of his own dominions. He did much to encourage education, his expenditure for this purpose exceeding two million Roman crowns, out of which many colleges at Rome were endowed. He reformed the Julian calendar.

Gregory, James (about 1683–1675), mathematician and inventor of the reflecting telescope, was b. at Drumoak, in Aberdeenshire, and received his education at Marischal College. In 1663 he published *Optica Promota*,

explaining the idea of the telescope which bears his name. He spent some years in Italy, and published at Padua in 1667 a treatise on the *Quadrature of the Circle and Hyperbola.*

Gregory of Nazianzus (*Gregorius Nazianzēnus*) (about 328 to about 389), a father of the Greek Church, b. near Nazianzus, in Cappadocia. He began to preach in 362, and between 365 and 374 was associated with his father in the bishopric of Nazianzus. He went to Constantinople about 378 or 379 to oppose the Arians, and was appointed bishop of that see by Theodosius in 380, but in the following year retired to his former charge of Nazianzus. His works consist of letters, sermons, and poetry. His eloquence is nearly on a level with that of Basil and Chrysostom.

Gregory of Nyssa (332–398), a father of the Greek Church, brother of St. Basil, b. at Sebaste, Pontus. By his brother's influence he was made Bishop of Nyssa, in Cappadocia. Having opposed the Arians, he was banished at their instigation by Valens from 375 to 378. He took a prominent part in the Councils of Constantinople from 381 to 394. His works consist of dogmatic treatises, Scripture commentaries, sermons, letters, etc.

Gregory of Tours (*Gregorious Florentius*) (539–595), historian of Gaul, b. in Auvergne. He became bishop of Tours in 573. He had the courage to oppose Chilperic and Fredegonde in their violent courses, and acted the part of a peacemaker in the dynastic quarrels of the period. His *Historia Francorum* is a valuable chronicle of sixth century events.

Gregory Thaumaturgus, St. (210–270 A.D.), b. in Pontus; became a Christian at an early age, and was a disciple of Origen; was bishop of Neocæsarea from 244 till his death. His life and miracles are narrated by Gregory of Nyssa.

Gregory the Illuminator, St. (258–342 A. D.), apostle of Armenia. From 302 to 331 he was patriarch of the Armenian Church, but the last years of his life were passed as a hermit.

Griefswald (Grīfs'vâlt), a town of Prussia, province of Pomerania, on the navigable river Rick, about 3 mi. above its entrance into the Baltic. It contains a university, founded in 1456, attended by about 600 students, and possessed of a library (100,000 vols.), museum, observatory, etc. It has manufactures of machinery, oil, paper, and tobacco; and a considerable shipping trade. Griefswald was one of the Hanse towns about 1270; was assigned to Sweden by the Peace of Westphalia, 1648; was occupied successively by various northern powers, and finally ceded to Prussia in 1815. Pop. 20,345.

Grena'da, one of the British West Indian Islands; about 85 mi. n.w. of Trinidad; oblong in form, 24½ mi. long n. and s., and 10 mi. broad; area 133 sq. mi. The island is traversed north to south by an irregular mass of volcanic mountains, attaining elevations of 3,000 and 3,200 ft. above sea-level, and having lateral branches of lower hills. The valleys between these contain alluvial tracts of great fertility. Rivers and rivulets are numerous, and most of the former capable of working sugar mills.

The climate is oppressively hot on the low lands, but cool and pleasant on the hills. Cocoa, sugar, rum, and spices stand first in the exports. The island has a lieutenant governor, and a local legislature consisting of a council and a house of assembly of seventeen elected members. The capital is St. George Town. Grenada was discovered by Columbus in his third voyage in 1498, and colonized about the middle of the seventeenth century by the French, who exterminated the Caribs. In 1762 it was taken by the British, and though recaptured by the French in 1779 was restored to Britain in 1783. Pop. 50,393, of whom only 835 are whites.

Grenade, a small hollow bullet or ball of iron or other metal, or annealed glass, about 2½ in. in diameter, filled with gunpowder, and fired by a fuse, so as to cause it to burst when thrown among the enemy. The term was first used by Du Billey, in reference to the siege of Arles (1536). Until about the end of the seventeenth century, when musketry became common, soldiers of the line were trained to throw grenades by the hand, hence the name *grenadier.* See the following article.

Grenadier, originally a soldier destined to throw the hand-grenades. Companies of grenadiers were formed in France in 1670, in England a few years later. With the development of the musket the name soon became only a *souvenir* of the ancient practise; the troops so called generally formed one battalion of a regiment, distinguished by the height of the men and a particular dress, as, for instance, the high bear-skin cap. With the British and French the grenadier company was the first of each battalion.

Gren'adines (or Grenadilles), a chain of small islands and rocks, West Indies, between the islands of Grenada and St. Vincent; principal island, Carriaco. They produce coffee, indigo, cotton, and sugar. Pop. 7,000.

Greno'ble, a fortified town of Southern France, capital of the department of Isère, finely and strongly placed on the Isère, 60 mi. s.e. of Lyons. It has a public library of 170,000 volumes and 7,500 MSS.; college, museum, bishop's palace, court house, arsenal, and extensive public gardens. The manufactures consist of gloves, which may be considered the staple, linen and hemp goods, liquors, leather, etc. Grenoble existed in the time of Cæsar, and Gratian, who had improved it, changed its name from Cularo to Gratianopolis. Pop. 1891, 60,439.

Gresham, Sir Thomas (1519–1579), a merchant of London. In 1552 he was sent as agent of Henry VIII's money affairs to Antwerp, where in two years he paid off a heavy loan, and raised the king's credit considerably. On the accession of Elizabeth he was deprived of his office, but it was soon restored to him, with that of queen's merchant, and he was also knighted. In 1556 he planned and erected at his own expense an exchange (the Royal Exchange) for the merchants of London. The "Gresham Law," in finance, is the principle that a less valuable currency inevitably sup-

plants and drives out the more valuable, in direct proportion to the abundance of the former medium.

Gresham, WALTER Q. (1832–1895), b. in Indiana. He was admitted to the bar in 1853 and elected to the state legislature in 1860, as a Republican. At the outbreak of the war he joined the Union forces and was made colonel of the Fifty-third Indiana regiment. Later he received the brevet of brigadier general, and later still major general of volunteers. He was appointed U. S. judge for Indiana in 1869, and was made postmaster general under President Arthur in 1882 In 1884 he again became U. S. judge. In 1893 he endorsed the Democratic platform and became secretary of state under President Cleveland in that year.

Gretna Green, a village of Scotland, in Dumfriesshire, on the Solway Firth, 8 mi. n. of Carlisle, for nearly a century notorious for the celebration of the marriages of fugitive lovers from England. To conclude a lawful (though irregular) marriage in Scotland, it is only necessary for an unmarried couple to go and declare themselves man and wife before witnesses, and it was in this way that these runaway couples were married; but such marriages were put an end to in 1856, by an act declaring that no irregular marriage in Scotland shall be valid unless one of the parties has resided in Scotland for twenty-one days next preceding such marriage.

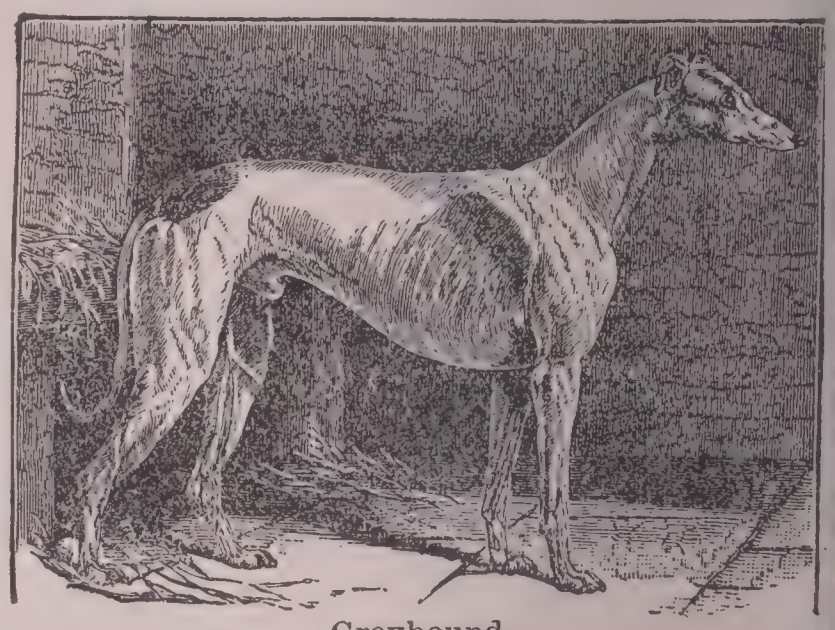
Grévy, FRANÇOIS P. J. (1807–1891), b. at Mont-Sous-Vaudre. He held several public offices during his early life, being a member of the National Assembly, and in 1871 its president. On the resignation of President MacMahon in 1879, M. Grévy was chosen president of the Republic for seven years, and in 1886 was re-elected. He resigned in December 1887.

Grey, CHARLES, EARL (1764–1845), English statesman, eldest son of Charles, first Earl Grey. He was educated at Eton and at King's College, Cambridge. In 1786 he was returned to Parliament as member for Northumberland. On the acccession of the Grenville ministry in 1806, Grey, now Lord Howick, was made first lord of the admiralty, and on the death of Fox succeeded him as secretary for foreign affairs and leader of the House of Commons. The death of his father in 1807 raised him to the House of Peers, and from this period up to 1830 he headed the opposition in the Lords, and especially opposed the proceedings against Queen Caroline. On the accession of William IV and the retirement of the Wellington ministry, Earl Grey was summoned to office.

Grey, LADY JANE (1537–1554), an interesting figure in English history, the daughter of Henry Grey, marquis of Dorset, afterward duke of Suffolk, by Frances, daughter of Charles Brandon, duke of Suffolk, and Mary, younger sister of Henry VIII, in whose reign Lady Jane was born. She was married to Lord Guildford Dudley, fourth son of the Duke of Northumberland, in 1553. Edward VI, who died in 1553, was induced on his deathbed to settle on her the succession to

the crown. The council endeavored to keep his death a secret, with a view to secure the persons of the princesses, Mary and Elizabeth, and when Mary discovered the design the council proclaimed Lady Jane queen. On the approach of Mary, however, the council deserted Lady Jane, and Mary was proclaimed queen. Jane was now confined to the tower. She and her husband were beheaded on Tower Hill, Feb. 12, 1554.

Greyhound, a variety of dog, distinguished by a greater length of muzzle than any other; very low forehead, short lips, thin and long legs, small muscles, contracted belly, and semipendent ears. There are several varieties, as



Greyhound.

the Irish greyhound, the Scottish, the Russian, the Italian, and the Turkish. The common greyhound is of an elegant make of body, and is universally known as the fleetest of dogs. The name appears to have no reference to the color, but is derived from the Icelandic *grey*, a dog. The chief breeds are the Newmarket, the Lancashire, and the Scotch.

Griffin (or Gryphon), a fabulous monster of antiquity, also common in heraldry, commonly represented with the body, the feet, and claws of a lion, and the head and wings of an eagle. India or Scythia was anciently assigned as the native country of the griffins; and it was alleged that they guarded the gold in the mountains.

Griffin, Spalding co., Ga., 43 mi. n. of Atlanta. Railroads: Central; S. G. & N. A.; and Georgia Midland. Surrounding country agricultural. Industries: cotton mills. The town was first settled in 1844. Pop. 1900, 6,857.

Grimal′di Family, one of the four families of the high nobility in Genoa. The lordship of Monaco belonged, for more than 600 years (beginning with 980), to the Grimaldi, and the ruler is still a Grimaldi. With the Fieschi they always played an important part in the history of Genoa, especially in the disputes between the Ghibellines and the Guelfs, to which latter party both families belonged.

Grimm, FRIEDRICH MELCHIOR, BARON (1723–1807), German man of letters, who lived mostly in Paris and wrote in French. He was b. at Ratisbon, and having finished his studies,

he went to Paris and there became acquainted with Jean Jacques Rousseau, Diderot, D'Alembert, D'Holbach, and other Parisian philosophers. In 1776 he was appointed envoy from the Duke of Saxe-Gotha to the French court, and honored with the title of baron. On the revolution breaking out he retired to Gotha, where he died.

Grimm, Jakob Ludwig (1785), German philologist, b. a Hanau in Hesse-Cassel. He was educated at Marburg University. In 1806 he became librarian to Jerome Bonaparte, king of Westphalia, and from 1816 to 1829 he occupied the post of second librarian at Cassel. From 1830 to 1837 he resided at Göttingen as professor and librarian, lecturing on the German language, literature, and legal antiquities. He published, in company with his brother, the *Kinder und Hausmärchen*, one of the most popular collections of fairy tales. D. 1863.

Grimm, Wilhelm Karl (1786–1859), brother of the preceding, was educated at Cassel and Marburg, and in 1830 he followed his brother to Göttingen, and obtained a professorship. He devoted himself especially to the German mediæval poetry, and published a treatise, *Ueber die deutschen Runen*, a translation of *Altdänische Heldenlieder, Balladen und Marchen*, etc., all with valuable introductions and disquisitions.

Grinding, a mechanical process in which certain effects are produced by attrition. This process prevails in various mechanical arts, as in grinding corn, etc., the object of which is to reduce the materials to a fine powder; or in grinding metals for the purpose of giving them a certain figure, polish, or edge. In the first case the grinding or crushing is effected by rough stones, or, as in crushing ores, between heavy metal cylinders, or by a heavy stone or iron cylinder revolving upon a smooth plate. The grinding of cutlery is effected by means of the grindstone (see below); emery powder grinds glass lenses and specula. Ornamental glass is ground into facets by stones and lap-wheels. Diamonds and other precious stones are ground with diamond dust. What is called *dry grinding* is the grinding of steel with dry grindstones. The points of needles are produced by this means, also the finishing of steel pens. Sand-jet grinding is a process in which abrasion is effected by the percussion of small hard particles on a plane surface, sharp siliceous sand being impelled by a blast artificially produced of steam or of air. By the use of flexible jointed connecting tubes the jet can be turned in any direction.

Grindstone, a cylindrical stone, on which sharpening, cutting, and abrasion are effected by the convex surface, while the stone is revolving on its axis. They are made of sandstone, or sandstone grit of various degrees of fineness. Artificial grindstones have been successfully tried.

Griqualand East, a region of South Africa, formerly known as No Man's Land, lying south of Natal, between Pondoland and Basutoland. It was incorporated with Cape Colony in 1874. Area 7,549 sq. mi.; pop. 1891, 152,618.

Griqualand West, a district of South Africa, n. of the Orange River, and w. of the Orange Free State; 180 mi. from e. to w., and 120 from n. to s.; area about 15,190 sq. mi. The prevailing character of the surface is that of undulating, grassy plains, suitable for grazing. Previously to the discovery of the diamond fields in the basin of the Vaal River, Griqualand was little known. In 1870 large finds of diamonds in that district began to attract wide notice, and in 1871 Waterboer, the Griqua chief, ceded all his rights to the British government, and the territory was incorporated with Cape Colony. The chief center of the diamond mining industry, and the seat of government, is Kimberly (pop. 25,000). The annual value of the mines sometimes reaches $20,000,000. The Griquas are a mixed race sprung from the intercourse of the Boers with their Hottentot slaves. Pop. 83,375.

Grisi (grē′sē), Giulia (1811–1869), a celebrated Italian vocalist, b. at Milan. After having studied music at Bologna, and made her *début* in Rossini's *Zelmira*, she appeared at Milan as *Norma*. She acquired great celebrity at Paris, in England, and America. She subsequently married Mario, the great tenor singer. Her voice gave way in her later years, and she d. at Berlin. Her principal character was *Norma*.

Gris-Nez (grē-nā), Cape, a headland, n.w. extremity of France, dep. Pas-de-Calais, the nearest point of the French shore to that of Britain, the distance being barely 21 mi. It has a revolving light, 195 ft. high.

Grisons (grē-sōn), the largest and most easterly canton of Switzerland, bordering on Austria and Italy; area 2,773 sq. mi.; pop. 94,991.

Griswold, Rufus Wilmot, D. D. (1815–1857), American writer, b. in Vermont. After having traveled extensively both in his own country and in Europe, he became successively a printer, a Baptist preacher, and a journalist. He was the author of the *Poets and Poetry of America*, etc. He was one of the editors of Edgar A. Poe's works.

Groats, the seeds of oats prepared as an article of food by being deprived of their hulls. They are much used in the preparation of gruel for invalids.

Grodno, a town, Russian Poland, capital of the government of same name, on the Niemen, 160 mi. northeast of Warsaw, a poorly built place, the principal edifice being a palace erected by Alexander III. The manufactures consist of woolen, linen, and silk goods, firearms, etc. Pop. 39,826. The government has an area of 14,931 sq. mi., largely occupied by pine forests and swamps. Pop. 1,321,157.

Groin, the angular curve made by the intersection of two semi-cylinders or arches. It is either regular or irregular: *regular*, as when the intersecting arches are of the same diameters and heights; and *irregular*, when one of the arches is semicircular, and the other semi-elliptical. In Gothic architecture groins are always ribbed.

Groningen (grō′ning-en), a town of Holland, capital of a province of same name, situated

on the river Huns here converted into a canal, 92 mi. northeast of Amsterdam. The principal edifices are the cathedral, a fine exchange, and the university. It has manufactures of white lead, soap, etc., oil, fulling, and sawmills, an excellent harbor, with an active trade. Pop. 48,896. The province forms the northeastern portion of Holland; area 790 sq. mi. It is protected against the encroachments of the sea by dykes, is very level, and is intersected by innumerable canals. Pop. 268,198.

Groote Eylandt (grō'te ī'lant) ("great island"), the largest island in the Gulf of Carpentaria, north of Australia, belonging to the colony of South Australia; greatest length and breadth 40 mi. each.

Gros (grō), ANTOINE-JEAN, BARON (1771–1835), a French historical painter, b. at Paris. In 1804 he produced his *Plague at Jaffa*, with Napoleon visiting the sick, a work which was crowded at the Louvre. He painted various battle scenes; but his chief work is probably the *Cupola of St. Geneviève* at Paris, exhibiting the saint protecting the throne of France, represented by Clovis, Charlemagne, St. Louis, and Louis XVIII. The artist received for it $20,000 and the title of baron.

Grosbeak, a general popular name for birds of at least three groups belonging to the conirostral division of the Insessores. The first comprises the cross bills; in the second group is the East Indian representative genus, with the beak large and parrot-like, but not crossing; the third group includes the pine grosbeak and the bullfinch. The term grosbeak was given to birds which had beaks proportionally larger than the most familiar forms.

Grossula'ceæ (Grossulariaceæ), a tribe of plants comprehending the gooseberry and currant of gardens, and consisting, in fact, of only one genus, Ribes, natives of most parts of the world except Africa and the tropics.

Grosswardein (grōs'vår-dīn), a royal free city of Hungary, capital of county Bihar, in a beautiful plain, on the Körös. It consists of the town proper, surrounded by walls, and otherwise fortified, and of extensive suburbs, is tolerably well built, and is a railway center. The staple manufacture is earthenware. Pop. 21,324.

Grote, GEORGE (1794–1871), English historian and politician. As early as 1823 he began to collect materials for his *History of Greece*, the first two volumes of which appeared in 1846. The remaining ten volumes followed in rapid succession, the final volume being published in 1856. The work terminates with the death of Alexander the Great, and as a whole is a monument of erudition, and has been translated into German and French.

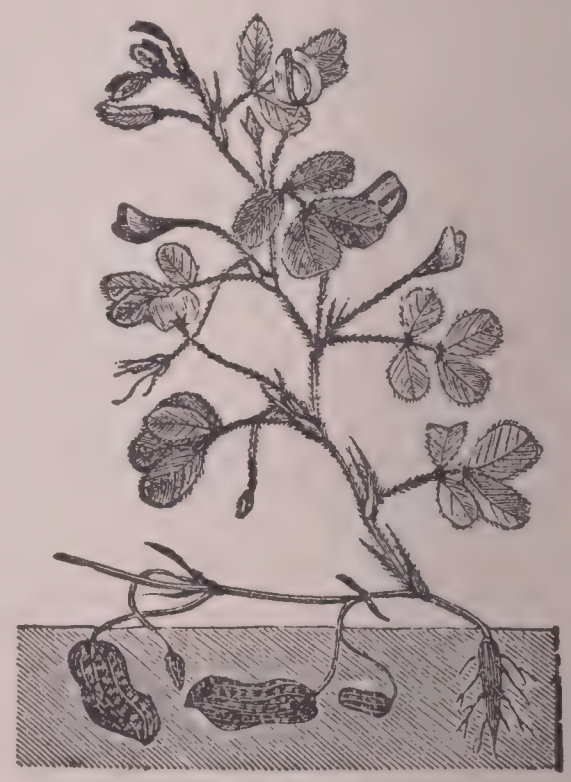
Grotius (or De Groot), HUGO (1583–1645), a Dutch scholar, b. at Delft. He entered the university of Leyden when only eleven, was a pupil of J. J. Scaliger, under whose supervision he edited *Marcianus Capella* and the *Phenomena of Aratus*. After several vicissitudes he went to Stockholm, entered the service of Queen Christina, and was appointed ambassador to France in 1635. His greatest work is *De Jure Belli et Pacis* (1625), on the fundamental principles of international law.

Grouchy (grö'shē), EMMANUEL, MARQUIS DE (1766–1847), a noted French general, b. at Paris. He entered the Royal Life Guards at the age of fourteen, saw much service, and highly distinguished himself. In the war with Prussia in 1806, and Russia (1807), and at Wagram, he acquired increased renown. In 1815 he defeated Blücher at Ligny. Having been ordered to follow the Prussian retreat, he was unable to aid Napoleon at Waterloo. He was banished under the second Restoration, and lived a few years at Philadelphia. He returned to France in 1821.

Ground, in painting, the first layer of color. The Italian school preceding and during the time of Raphael employed white grounds, but afterward, when canvas had superseded panels, the Italian and Spanish schools adopted an oil ground of a dull red color. The Dutch and Flemish masters used light grounds, varying from white to gray, and their example has been followed by the English painters and those of the modern European schools.

Ground Ivy, a common wayside plant of the order Labiātæ, with a creeping stem and purple flowers. Tea made from it is used for pectoral complaints. It was formerly employed to flavor ale.

Groundnut, a term which denotes the seeds or pods of the *Arăchis hypogæa*, or the tubers of certain umbellifers (earth nuts). The *Arăchis hypogæa* is a leguminous annual of diffuse habit, with hairy stem, and abruptly pinnate leaflets. The nut or pod is situated at the end of a stalk of some length, and is ripened under



Groundnut.

ground, this stalk having the peculiarity after flowering of bending down and pushing the fruit into the earth. The plant is extensively cultivated in tropical countries. The nuts have a flavor similar to almonds, and yield an oil that may be used for olive oil.

Ground Squirrel, the name of squirrels of the genus *Tamais*, somewhat resembling the

marmot. They differ from the common squirrel in possessing cheek pouches, and in retreating into burrows. They are well known in America, but species are also found in Asia and Africa.

Grouse, the general name of the gallinaceous birds of the family Tetraonidæ, whose distinguishing mark is a naked band, often of a red color, in place of an eyebrow. They are wild, shy, and almost untamable. They live in families, in forests and barren regions, and feed on berries, buds, and leaves. They are polygamous, the male abandoning the female, and leaving to her the whole care of the progeny. The eggs number eight to fourteen. The largest species is the *wood grouse.* Other

The Red Grouse.

British species are the black grouse, the red grouse, commonly called simply the grouse, and the white grouse or ptarmigan. The black grouse is about the size of a common fowl. The male has the outer feathers of the tail curved outward, so that the tail is lyre-shaped. It chiefly lives in high and wooded situations, feeding on various kinds of berries. The female is commonly called *gray hen.* To this genus belong several species peculiar to N. A., the most remarkable of which is the *pinnated grouse,* or prairie hen, which inhabits open desert plains in the West. The male is furnished with wing-like appendages to his neck, covering two loose orange sacs, capable of being inflated. Another species is the *cock of the plains* which is found in the far West, especially about the branches of the Columbia River. The grouse with hairy feet and which undergo seasonal change of plumage form the genus *Lagopus.* Of these the *red grouse* is the most important. The ruffed grouse—sometimes called partridge, is found in the northern part of the U. S. as far west as the Rocky Mountains. The male is distinguished for his "drumming"—a noise which he makes while standing on a log, by beating the air with short and quick strokes of the wings.

Grow, Galusha A. (1824–), statesman, was b. in Connecticut, removing to Pennsylvania in 1834. In 1850 was elected to Congress, serving twelve years. The Homestead bill received his earnest support. He was elected speaker of the House in 1861. In Congress his services were important, being an active working member.

Grubber, an agricultural implement for tearing and loosening soil, and for eradicating roots, etc. It consists of an iron framework with handles and wheels, and provided with curved *tines* or teeth. In the most approved kinds the wheels are arranged three in front and two behind. The depth to which the teeth may penetrate is regulated by suitable mechanism.

Grunt (Grunter), an American fish of the family Hæmulonidæ, also termed *pigfish* and *redmouth.* The first of these names relates to the sound it emits when taken out of the water, the last to blood-red marks on the gums or lips. The Growler, found off America, also emits a grunting sound.

Grysbok (grīs′ bok) ("grey buck"), a species of antelope found in Southern Africa. It attains about 3 ft. in length, is 1½ ft. high at the the shoulder, and its color is reddish-gray. It is hunted for the sake of its flesh.

Guacharo (gwä-chä′ rō), a bird of the goatsucker family, of nocturnal habits, a native of South America, and found in great numbers in certain caves of Venezuela, Trinidad, and elsewhere. It is about the size of a common fowl, with a curved and toothed bill, wings long and pointed. Their food is principally fruits, upon which they grow so fat that the Indians destroy great numbers for the sake of

Guacharo.

their oil or clarified fat, which is transparent, inodorous, and keeps long without becoming rancid. It is also called *Oilbird.*

Guadalajara, a city of Mexico, capital of the state of Jalisco, in the fruitful valley of Atemajac, on the Rio de Santiago; a large and handsome city, with a fine cathedral (being an archbishop's see), and other good buildings; a university, a mint, convents, etc. Various manufactures are carried on, as those of silversmiths' and goldsmiths' wares, paper, leather, hats, pottery, cloth, etc. Pop. 93,875.

Guadalquivir (gwä-*d*äl-kē-vēr′), a river of Spain, which rises in the frontiers of Murcia, traverses Andalusia from n.e. to s.w., passing the towns of Cordova and Seville, and thereafter flowing s.s.w., falls into the Atlantic. Its course is 250 mi., of which 70 mi. are navigable. It abounds with fish.

Guadeloupe (gä-dė-löp), one of the French West Indies, composed of two portions, separated by a narrow arm of the sea called Rivière Salée (salt river). The western and larger portion is Basse-terre, or Guadeloupe Proper, 27 mi. long by about 15 mi. broad. The eastern portion, called Grande-terre, is nearly 30 mi. long by 10 to 12 mi. broad. Guadeloupe Proper is of volcanic formation, the culminating point being La Soufrière, 5,018 ft. Grande-terre, on the other hand, is generally flat, and of coral formation. The climate is hot and unhealthy, with a remarkably humid atmosphere, and hurricanes are frequent and destructive. The soil is fertile. The chief exports are sugar, coffee, dye and cabinet woods, pepper, manioc, tobacco, etc. The chief town is Basse-terre. Pop. 134,000, or with its dependencies (Marie Galante, Desirade, etc.), 200,000.

Guadiana (gwå-*di*-ä′nå), a river of Spain, which rises in New Castile, flows first northwest, then southwest into Estremadura, and on reaching Badajoz begins to form part of the boundary between Spain and Portugal. Entering that kingdom, it finally falls into the Atlantic after a course of 400 mi., of which only 35 are navigable.

Guad′uas, a town, republic of Colombia, remarkable as being one of the most elevated places on the globe, being 8,700 ft. above the sea level. Pop. 8,500.

Guaiacum (gwī′a-kum), a genus of plants, belonging to the natural order *Zygophyllaceæ*, and containing four or five arborescent species, natives of the West Indies and the tropical parts of America. *G. officinale* has wood that is exceedingly hard, of a pale yellow color near the exterior, and blackish brown at the heart, heavier than water, and well known under the name of *lignum vitæ.* Among other uses it is

Guaiacum.

employed in the construction of ornamental articles of furniture, being susceptible of a fine polish. This tree yields the resin known as guaiacum, which either flows spontaneously from the tree, or from incisions or perforations in the stem, or is got by extraction by means

of spirit from the wood. It is greenish brown, has a balsamic odor, taste somewhat bitter and pungent, and it dissolves freely in spirit, but is insoluble in water. Its chief use is in medicine, the resin (as well as a decoction of the bark and wood) acting as a stimulant in chronic rheumatism, and being used also in gout, scrofula, syphilis, etc.

Gualegwaychu′ (gwå-le-gwī-chö′), a town of the Argentine Republic, prov. Entre Rios, on river of same name. Pop. 15,000.

Guam, one of the Ladrone Islands discovered by Magellan in 1521. Agana, the former Spanish capital of the Ladrones, is situated upon this island. The island was captured by the U. S. *Charleston* on its way from San Francisco to Manila in July, 1898. It was retained by the U. S. when peace with Spain was restored.

Gu′an, a gallinaceous bird of the family Cracidæ or Curassows, genus *Penelŏpē.* The sides of the head and front of the throat are naked and wattled, the wattles capable of in-

Guan.

flation. The name Guan is more particularly applied to the *Penelŏpē cristata*, the largest bird of the genus, measuring about 30 in.

Guanaco (gwån-ä′kō), a South American ruminant, closely akin to the llama, alpaca, etc. It abounds most in Chili and Patagonia, attains a height of nearly 4 ft. at the shoulders, is extremely swift and sure-footed. When domesticated its flesh, wool, and milk are prized by the natives. In domestication it is of uncertain temper, and ejects saliva on those who annoy it.

Guanaxuato (gwå-nå-*h*wä′tō), a city of Mexico, capital of the state of the same name, 160 mi. n.w. of Mexico, is situated in a narrow defile, hemmed in by mountains, at the height of 6,800 ft. above the sea, with steep, irregular streets, but well built houses. Pop. 63,000. The state is situated in the center of Mexico; area 11,411 sq. mi.; pop. 1,007,166. Its mines, once the richest in the world, still yield a large amount of gold and silver. The surface is traversed by the cordillera of Anahuac, 9,711 ft. in height.

Gua′no (Peruvian *huano*, dung), a valuable manure, consisting of the partially decomposed and dry excrement of fish-eating sea-

birds, which has in some places accumulated in great masses. The most important of all were the deposits on the Chincha Islands off the coast of Peru, which yielded a considerable revenue to the country, but are now quite exhausted. From 1853 to 1872 about 8,000,000 tons were got from these islands. The guano which was found there was from 60 to 80 or 100 ft. in thickness, and was entirely due to the droppings, accumulated for many ages, of the innumerable sea birds which make these islands their resting place and breeding ground. Other deposits of less extent have from time to time been found, and Peru still remains the chief source of supply, its deposits being now, however, worked under the Chilean government. Guano varies extremely in composition, but it may be roughly divided into nitrogenous and phosphatic. The first of these contains about 21 per cent. of ammonia. This is the case with the Peruvian variety, which contains almost all the inorganic matter required by a plant, and that in a highly available form, so that it is looked upon as one of the best of all fertilizing agents for different crops. Its use as a manure was known to the native Peruvians centuries ago, but no attention was paid to the accounts by modern travelers of its wonderful efficacy until A. von Humboldt brought some to Europe and had it analyzed. It began to be brought to Europe about 1846. It is used raw or in its natural state, but most of the phosphatic guanos (some of which hardly deserve the name of guano) require to be dissolved by sulphuric acid before using. There are also manures known as *fish guano*, prepared from fish or fish refuse, *flesh guano*, *blood guano*, etc. Large quantities of fish guano are made in the U. S., the menhaden being the fish used, and the oil being extracted before the fish are ready for conversion into manure.

Guapore (gwȧ-pō′rā) (or Itenez), a river of South America, which rises in the Brazilian province of Matto Grosso, and after a varied course of about 500 miles, unites with the Mamore in forming the Madeira.

Guarantee′, in law, an undertaking by which a person binds himself to answer for the failure of another. In the U. S. no person is liable on any special promise to answer for the debt, default, or miscarriage of another person, unless a written agreement, or some memorandum in writing for such purpose, shall be signed by the promiser or some other party lawfully authorized by him. It is a general rule that the surety shall not be bound beyond the express words of the engagement.

Guardafui (gwȧr-dȧ-fwē′), Cape (or Ras Jerdafoon), the most eastern point of Africa, at the entrance of the Gulf of Aden, a frequent scene of shipwreck.

Guardian, in law, the custodian of persons incapable of directing themselves, and especially of infants—that is, persons under 21 years of age. A guardian is not allowed to reap any benefit from his ward's estate, but must account for all profits. He can invest the money of his ward in real estate only by

order of court; nor can he convert real estate into personalty without a similar order. If he spends more than the interests and profits of the estate in the maintenance and education of the ward, without permission of court, he may be held liable for the principal thus consumed. He is entitled to the care and custody of the person of his ward. Guardianship lasts until the ward has attained his majority.

Guarini (gwȧ-rē′nē), Giovanni Battista (1537–1612), Italian poet, was b. at Ferrara. His propensity to litigiousness necessitated his residence at Venice, Padua, and Rome. In 1605 he went as an ambassador of his native city to the court of Rome, to congratulate Paul V on his elevation. He d. at Venice. Guarini is one of the most elegant authors of Italy, as is especially shown in his *Pastor Fido* (*Faithful Shepherd*), a famous pastoral drama.

Guatemala (gwa-te-mä′la), a republic of Central America; area est. at 46,800 sq. mi.; pop. 1,460,017. It is in general exceedingly picturesque, and distinguished by a luxuriant and varied vegetation. It is wholly mountainous or elevated, the main chain of the continuation of the Andes traversing it southeast to northwest, and sending off numerous branches. Along the main chain are a considerable number of volcanoes, several of which are said to be active—as Fuego and Agua (14,890 ft. high), which sends forth torrents of water. The state is well watered by numerous streams, none of much importance. There are several lakes, the most important being Dulce, through which a great part of the foreign trade of the state is carried on. On the table-land, of which a considerable portion of the state is formed, the climate is mild; but in more elevated situations the cold is intense. There is much valuable timber. The soil generally is of great fertility, producing according to altitude, soil, etc., maize, wheat, rice, coffee, cotton, tobacco, sugar, cochineal, cacao, indigo, vegetables, and tropical fruits in great variety. Fiber plants are numerous, including ramie, henequen, and others. The most important product is coffee, and the other chief exports are skins, caoutchouc, cochineal, wool, etc. The trade is chiefly carried on with the U. S. and Britain. The exports average about $6,500,000 in annual value, the imports being about the same. In the *altos* or mountainous parts of the northwest considerable flocks of sheep are raised, the wool of which is manufactured into coarse fabrics. But the manufacturing industries are very insignificant, and trade is hindered by the want of roads and railways, the total length of the latter being only about 150 mi. Only about a third of the population are of European or mixed descent, the rest being Indians of the Aztec, Toltec, or Maya races, mostly speaking their own native tongue. Numbers of the Indians are still quite uncivilized. Great attention is now being paid to education, the children, even Indians, in small and remote villages being compelled to attend school. The capital is Guatemala la Nueva (New Guate-

mala). The chief port is San José on the Pacific; Champerico on the Pacific, and Livingston in the Bay of Honduras, are the other ports. The legislative power is vested in a national assembly elected for six years by universal suffrage. The executive is vested in a president, elected for four years. The revenue is about $4,509,000 annually; the public debt over $11,500,000. NEW GUATEMALA (or Santiago de Guatemala), the capital, is situated about 5,000 ft. above the sea, and 80 mi. distant from the Pacific. It is regularly built, has a fine cathedral, archbishop's palace, a university, etc., and manufactures of textiles, cigars, pottery, saddlery, embroidery, etc. Pop. 59,000. OLD GUATEMALA, the former capital, was founded by the Spanish in 1542, and continued to be the capital till 1774, when it was destroyed by a volcanic outbreak. It has been rebuilt, and the population is now about 20,000. Reciprocity of trade with U. S. was established in May, 1892.

Guava (gwä'va), the popular name for plants of the tropical genus *Psidium* of the nat. order Myrtaceæ. The guava tree is a small tree, with square branches, egg-shaped leaves, and large white axillary flowers, which are succeeded by fleshy berries, which are either

Guava; *a*.—section of fruit.

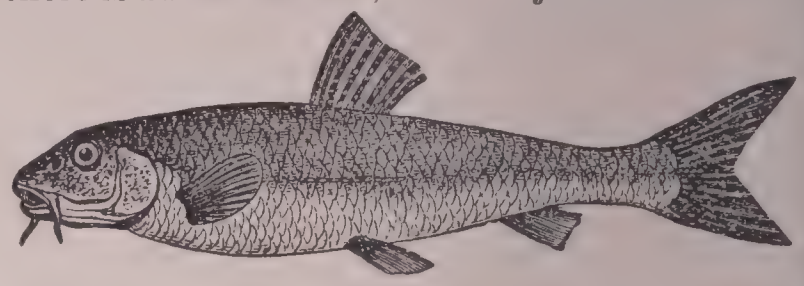
apple or pear-shaped in the two principal varieties. The pulp is of an agreeable flavor, and of this fruit is made a delicious and well-known jelly. There is also a produce called guava cheese.

Guaviare (gwå-vi-ä'rā), a river of South America, Colombia, an affluent of the Orinoco; length 900 mi.

Guayaquil (gwī-å-kēl'), a city and seaport in Ecuador, on the Guayaquil, here about 2 mi. wide, and some 40 mi. above its mouth in the Gulf of Guayaquil. Behind the town there is an extensive marsh, which renders it unhealthy. There is also a deficiency of water, but the town is improving, and has already tramways and telephones. It is the chief port of Ecuador, and one of the best on the west coast of South America. Its principal exports are cacao (to the value sometimes of $5,000,000), coffee, and ivory nuts. Pop. est. at 40,000.

Guben, a town in Prussia, province of Brandenburg. Brewing, dyeing, and tanning are carried on, and there are manufactures of woolen and linen cloth, tobacco, etc. Pop. 27,091.

Gudgeon, a fresh-water fish, belonging to the carp family. It has short dorsal and anal fins, without spines; on each side of the mouth there is a small barbel; neither jaw is furnished



Gudgeon.

with teeth, but at the entrance of the throat there are two triangular bones that perform the office of grinders. These fish are taken in gentle streams, and measure only about 6 in.

Guebres (Guebers) (gē'bėrz), a name given to the fire-worshipers of Persia, represented in India by the Parsees. The original Guebres or followers of Zoroaster are now represented almost solely by those who inhabit the cities of Yezd and Kirman and the adjoining villages. At present they number only about 7,000. As supreme deity they recognize Ahuramazda, or Ormuzd, the principle of light and source of all that is good; and his opposite and antagonist, the evil principle, the latter called Ahriman. Among their leading practises may be mentioned their refusal to contract marriages with those of other creeds; their objection to eating beef or pork, or to partaking of anything cooked by one of another religion, etc. When, in 1651 A.D., Yezdegird, the last of the Sassanides, was defeated by the Caliph Omar, the majority of the Persians embraced Islamism. Those who continued Zoroastrians received the name of Guebres or infidels, and were subjected to persecutions so severe that the majority emigrated to India, where they became known as Parsees.

Guelder Rose (or Gueldres Rose), a name

The Guelder Rose.

given to the cultivated variety of the *Viburnum Opulus*, or water elder. On account of the shape and color of its flowers it is sometimes called the Snowball Tree. Its fruit is of a pretty red color.

Guelfs (or Guelphs), the name of a distinguished princely family which originated in Germany, but was also at one time connected with Italy, and which still flourishes in the two lines of the House of Brunswick, the royal (to which the reigning family in Britain belongs) and the ducal. The first who bore the name is said to have been Welf, the son of Isenbrand, whose grandfather was a vassal of Charlemagne.

Guelfs (or Guelphs) **and Ghibellines,** the names of two great Italian political parties in the thirteenth and fourteenth centuries. The names are derived from the Italian *Guelfi* and *Ghibellini*, which are corrupted from the German *Welfen* and *Waiblingen*. These latter words came to be used as party designations in Germany, in the war between Henry the Proud and Conrad of Hohenstaufen, to whom belonged the estate of Waiblingen in Würtemberg. About the year 1200 the designations Guelf and Ghibelline came to be employed to denote respectively the Italian patriotic and papal party, and the party which supported the domination of the German emperors in Italy. After the fall of the Hohenstaufen the Ghibellines became the partisans of aristocracy, and the Guelfs the partisans of democracy and liberty; but the designations ultimately denoted mere communal and family feuds, and Dante, originally a Guelf, but subsequently a Ghibelline, asserted that the two parties were the cause of all the miseries of Italy. The contest continued with bitterness for almost 300 years.

Guelph, Wellington co., province of Ontario, on Speed River. Railroads: Grand Trunk and Canadian Pacific. Industries: organ and piano co., two flouring mills, two iron foundries, two woolen mills, rolling mills, sewing machine, furniture and farm implement factories. Surrounding country agricultural and stock raising. The town was first settled in 1827 and became a city in 1877. Pop. est. 1897, 11,500.

Guereza (or Guerza) (ger'e-za, ger'za) a species of monkey remarkable for its beauty, inhabiting the mountains of Abyssinia. Short, glossy, jet-black fur covers its limbs, back, and head, while a long fringe of silky white hair depends from the flanks. It frequents lofty trees.

Guericke (ger'ik-e), Otto von (1602–1686), German physicist, b. at Magdeburg (of which he became burgomaster or mayor). About 1650 he invented the air pump, with which he made public experiments at the diet at Ratisbon, before the Emperor Ferdinand III. His most important observations, collected by himself, appeared at Amsterdam in folio (in 1672).

Guernsey (gērn'ze), the second largest and most western of the Channel Islands, lying off the north coast of France, 46 mi. from Cherbourg, and about 68 mi. from Start Point in Devonshire. The soil is fertile. The breeding of cattle and the dairy are the principal objects of attention; and the butter made is highly esteemed. Horticulture and floriculture also receive much attention, and fruit, especially figs and grapes (the latter grown under glass), is very abundant. The principal exports are cattle (the dairy cows being renowned), fruits, vegetables in the early spring, granite for paving, etc. The dialect of the island is the pure Norman of some centuries ago; but a knowledge of English is general. The principal place of education is Elizabeth College, at St. Peter's Port, the capital, and only town in the island. Pop. 32,659.

Guernsey Lily, a beautiful plant, with purple-red flowers, native of South Africa, family Amaryllidaceæ, so called from some of its bulbs being cast up in Guernsey from a wrecked ship and there taking root. There are several other species also called Guernsey lilies.

Guerrero (ger-rā'rō), a state of Mexico; area 24,227 sq. mi. Its surface is finely diversified by mountain and valley, and partly covered by native forests; and it is rich in minerals, including gold, silver, copper, and iron. The principal port is Acapulco. Pop. 332,887, mostly Indians.

Guglielmi (gụl-yel'mē), Pietro (1727–1804), Italian composer. He composed comic and heroic operas for the Italian theater, visited Vienna, Madrid, and London, and afterward returned to Naples, where he became the rival of Paesiello. In 1793 Pius VI named him chapel-master of St. Peter's. He left more than 200 pieces, remarkable for their simple and beautiful airs, their rich harmony, and their spirit and originality.

Guiana (gī-an'a) British, a colony in the n. of South America, about 560 mi. long, and about 200 mi. broad, having e. Dutch Guiana, w. Venezuela and Brazil, n. and n.e. the Atlantic, and s. Brazil; est. area 76,000 sq. mi. It is divided into three settlements—Berbice, Demerara, and Essequibo. On the western boundary is the singular flat-topped and almost inaccessible mountain Roraima, rising to a height of 8,600 ft. The other principal ranges are the Sierra Imataca, in the n. part of the country; the Cannucu, or Conocou, and the Sierra Acarai—the last occupying the extreme s.e. corner of the territory forming its boundary in this direction. They are densely wooded, but do not reach a greater elevation than 4,000 ft. The chief rivers are the Essequibo, Demerara, Berbice, and Corentyn. The climate, though moist and warm, is not on the whole unhealthy. Cultivation is confined to the coast region; the soil is very fertile, and much of it well adapted for the sugarcane, the cultivation of which is mostly carried on by Indian and Chinese coolies. Guiana also produces coffee, tobacco, indigo, etc. Vegetation is singularly luxuriant, and the forest trees are of the most magnificent description. Fruits, medicinal plants, fibrous vegetables, dyeing woods, etc., abound. Guiana has two dry and two wet seasons, each continuing for

three months: December, January, February, June, July, and August, coustitute the wet season, the other months of the year the dry. The mean annual temperature is nearly 81° 2′. Violent thunderstorms occur at the change of the seasons; but the hurricanes, so destructive in the West Indies, are unknown. In the dry seasons the climate is agreeable, and in the interior, more healthy than in many parts of the West Indies. The trade is concentrated mainly in Georgetown, the capital. Sugar, rum, and molasses are the principal exports. The exports in the year 1891 were $12,000,000; imports amounted to $8,000,000. The government consists of a governor and a court of policy of 15 members; also a combined court, consisting of the court of policy and 6 financial representatives. Guiana was first settled by the Dutch about 1580. It was taken by the British in 1783, 1796, and again in 1803, and latterly it was definitely given up to them. Pop. 288,328; a great proportion being of African race or coolies from India.

Guiana, Dutch (or Surinam), a Dutch colony in South America, situated between English and French Guiana; area about 46,060 sq. mi. The general aspect is the same as that of British Guiana—flat and swampy on the coast, and mountainous in the interior; well watered by numerous streams, and of which the Surinam and its affluents are the chief. It has also a similarly warm, moist climate, and is very fertile. Only a small part of the colony is under cultivation. On the Surinam River, about 10 mi. from its mouth, is situated the capital, Paramaribo. The principal exports are sugar, coffee, molasses, and rum. The government is vested in a governor general and council. Pop. 57,141.

Guiana, French, a French colony in South America, between Dutch Guiana and Brazil; area about 35,000 sq. mi. This territory resembles British Guiana in its physical features, climate, and vegetable productions, with the addition, in the latter case, of pepper, cloves, cinnamon, nutmeg, etc. The colony comprises the island of Cayenne, celebrated for the pepper bearing that name. Gold has also been found in considerable quantities. The French are said to have first settled in Cayenne in 1604. Pop. 25,157.

Guido Reni (gwē′dō rā′nē) (1575–1642), a celebrated Italian painter, b. at Bologna. Being the son of a musician he devoted some time to the study of music, but as painting seemed his true vocation, he was placed under the tuition of Dionysius Calveart, and subsequently joined, in his twentieth year, the school of the Caracci. Among his most famous works may be mentioned his *Aurora*, his *Magdalene*, *Michael Vanquishing Satan*, *Lot and his Daughters*, his *Fortune* etc.

Guild, a society or association for carrying on commerce, a handicraft, or some other undertaking. Such associations are known from very early times in various countries. The societies of tradesmen exclusively authorized to practise their art, and governed by laws of their own, played a very important part in

the Middle Ages. They often formed a bulwark against the oppression of the nobility, and were thus extremely conducive to the growth of municipal and civil liberty. The purely Teutonic guilds, although connected with the constitution of the cities, possessed certain peculiarities. In the thirteenth century the German guilds of craftsmen obtained the right of defending by arms their own interests, and became so powerful that persons unconnected with a trade were often glad to attach themselves to them. With the view of destroying the political influence which they had acquired, the Emperor Frederick II abolished them by a decree issued in 1240; but the decree remained without effect, as did also the clauses inserted with a similar view into the Golden Bull in 1356, and it was not until the present century that unrestricted freedom to practise any trade was established in the German states. In Austria this was done in 1860, and in 1868 it was done for all the states of the North German Confederation. In Britain trade guilds long possessed an importance which was mainly political. As the right of voting was involved in the membership of a guild, many persons, not mechanics, acquired the rights of "freemen" by connecting themselves with some body of this kind. These guilds, in England, had no legal right to prevent any man from exercising what trade he pleased. The only restriction on the exercise of trades was the statute of Elizabeth, requiring seven years' apprenticeship. This the courts held to extend to such trades only as were in being at the time of the passing of that statute; but by an act passed in 1835, every kind of restriction on artisans, trades, etc., was abolished. The guilds or companies of the city of London are still very important corporations, which give relief to poor and disabled members, and also manage vast funds bequeathed for benevolent purposes. Many of the trades-unions have now somewhat of the character of the ancient guilds.

Guillemot (gil′e-mot), a name of several web-footed birds belonging to the family Alcidæ or auks. The guillemots have a straight, compressed, and pointed bill, covered with feathers as far as the nostrils, and have no hallux or hind toe. The wings are pointed and very short, the legs also short, and placed far back. They live on fish, and build on precipitous rocks adjoining the sea.

Guillotine (gil-lo-tēn′), an engine for beheading persons at one stroke—an invention of the Middle Ages—adopted with improvements by the National Assembly of France during the first revolution on the proposal of a Dr. *Guillotin*, after whom it is named. In this apparatus decapitation is effected by means of a steel blade loaded with a mass of lead, and sliding between two upright posts, grooved on their inner sides, the person's neck being confined in a circular opening between two planks, the upper one of which also slides up or down. On the right of the table is a large basket or trough of wicker-work for the reception of the body. Under the place where the head rests is an

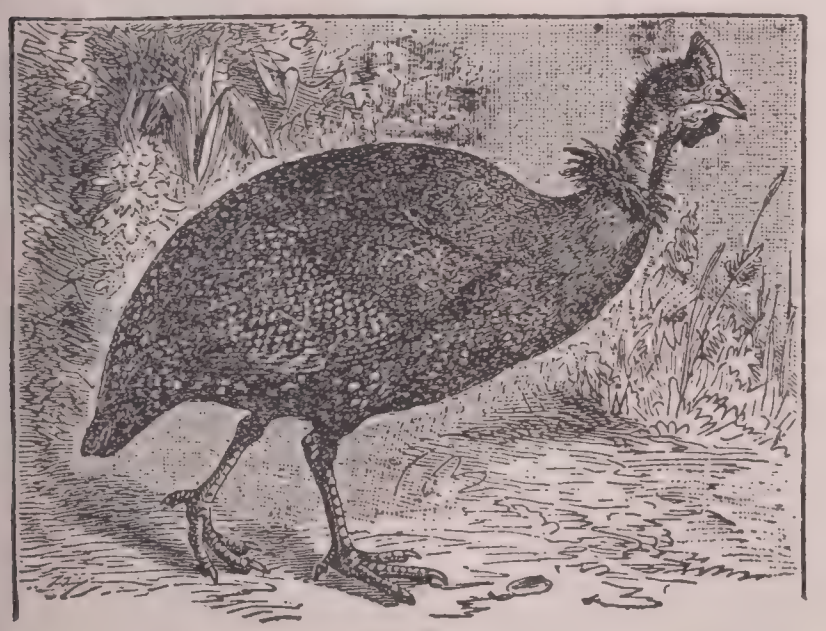
oblong trough for its reception. The knife is fixed to the cap or lintel on the top of the posts by a claw in the form of an 8, the lower part of which opens as the upper part closes. This claw is acted upon by a lever to which a cord is attached. When the head of the condemned is in position the cord is pulled, and by the action of the lever the knife is set at liberty, descending by the grooves in the upright posts and falling upon the neck of the condemned just behind the planks which keep the head in position. The scaffold, which is surrounded by an open railing, is raised 6 or 7 ft. from the ground. The same name is given to a machine which cuts by a knife descending between grooved posts, much used for cutting paper, straw, etc.

Guinea (gin′ē), a geographical division of Western Africa, including the Atlantic coastline and an indefinite area of the interior between the frontiers of Senegambia and Cape Negro, or Cape Frio (where German territory now begins). It is divided into two districts, lying north and south of Cape Lopez: the former, called North or Upper Guinea, includes Sierra Leone, Liberia, the Grain, Ivory, Gold, and Slave coasts, the states Ashantee, Dahomey, Benin, etc.; the latter, called South or Lower Guinea, includes Congo, Angola, and Benguela.

Guinea, an old English coin worth 21s. sterling, or about $5. Guineas were first coined in the reign of Charles II (1663), of gold from Guinea, and bore the figure of an elephant. In 1817 the coin was withdrawn from circulation. It is, however, still customary to estimate professional honoraria, etc., in guineas.

Guinea, GULF OF, that portion of the Atlantic which washes the shores of Upper Guinea, between Cape Palmas and Cape Lopez, and including the bights of Benin and Biafra. The islands of Fernando Po, Prince's, and St. Thomas, are within this gulf.

Guinea Fowl (or Pintado), a genus of gallinaceous birds, or pheasants, originally all natives of Africa. The common guinea fowl, now



Guinea Fowl.

well known as a domestic fowl, has a slate-colored plumage varied with round white spots. It is about the size of a common fowl, and is of a noisy and quarrelsome disposition. Its eggs are esteemed.

Guinea Grass, a very tall species of grass, a native of Africa, of the same genus with the millet, often 6, and sometimes even 10 ft. in height. It has been naturalized in South America and the West Indies, and largely cultivated for fodder. It does not perish even in the temperate zone, but there it is not so productive as in warmer climates.

Guinea Pepper, a lofty tree of the same family with the custard apple. Its fruit, consisting of dry carpels, is used as pepper, "negro pepper." The term Guinea pepper is often used as an equivalent for *Grains of Paradise*, or Malaguetta.

Guinea Pig, a well known rodent mammal, family Cavidæ (or Cavies). The domestic specimen is sometimes regarded as descended from *Cavia aperea*, and sometimes termed *Cavia cobaya*. It is a native of South America

Guinea Pig.

(like the other cavies), and resembles the pig only in its grunting voice. It is a timid little animal, extremely prolific, and it feeds on vegetables, especially parsley, bread, grain, etc. It is very destitute of intelligence.

Guinea Worm, a parasitic worm, white, of the thickness of pack thread, somewhat attenuated at the hook-shaped posterior extremity. It varies in length from six inches to several feet, and is found in the intertropical regions of the Old World. It is frequently found in the tissue of the human body below the skin, and produces a painful ulcer, out of which a small portion of the worm issues to eject its eggs. It is then carefully extracted by winding it round a stick once or twice every day, care being exercised not to break the worm. The manner in which it effects an entrance into the body is unknown.

Guise (gwēz), a town of France, dep. of Aisne, beautifully situated on the left bank of the Oise. It has manufactures of textiles, iron and copper foundries, etc., and a large work for making stoves, connected with which is an edifice in which live some 400 families of the working people. It is an ancient city, and its castle gave its title to the distinguished family of that name. See the following article. Pop. 7,677.

Guise (gwēz), a distinguished ducal family of France, a branch of the house of Lorraine. The founder was Claude, a son of René II, duke of Lorraine, who in 1506 became naturalized in France. In his favor the county of Guise was erected in 1528 by Francis I into a duchy. He d. in 1550, leaving behind him five

daughters (the eldest of whom, Marie, married James V of Scotland, and was the mother of Mary Queen of Scots) and six sons—François, who succeeded him, Charles (Cardinal of Lorraine), Louis (Cardinal of Guise), Claude, François, and René. The family acquired great political importance on the accession of Francis II, who was married to Mary Queen of Scots. The direct line became extinct in 1675. In 1704 the title was revived for the house of Condé. Two of the dukes require particular mention. François de Lorraine, the second duke, b. in 1519, early distinguished himself in war, especially at Metz, which he defended with success against Charles V, and at the battle of Renti, 1544. Under Henry II and Francis II he was the virtual ruler of France. On the death of Francis II the factions of Condé and Guise arose, the Protestants (Huguenots) being on the side of the former, the Catholics on that of the latter. When civil war broke out the Duke of Guise took Rouen and Bourges, and won the battle of Dreux in 1562. He was preparing for the siege of Orleans, the central point of the Protestant party, when he was assassinated by a Huguenot nobleman, February, 1563. He left memoirs written by himself. Henry, third duke, eldest son of the preceding, was b. in 1550. He was a bitter opponent of the Huguenots, and fought against them at Jarnac and Moncontour, and advised the massacre of St. Bartholomew (1572). From revenge he personally conducted the assassins to the house of Coligny.

Guitar (gi-tär′), a stringed instrument with a hollow body, and a neck somewhat similar to that of a violin, used especially to accompany the voice. The modern or Spanish guitar has six strings, the three highest of gut, the three lowest of silk covered with fine wire, tuned respectively to the E in the third space of the bass staff, A its fourth, and the treble D, C, B, and E. The Spaniards derived it from the Moors, who brought it from the East.

Guizot (gē-zō), FRANÇOIS-PIERRE-GUILLAUME (1787–1874), French historian and statesman, b. at Nîmes. His father, a lawyer, having in 1794 perished by the guillotine, his mother and her three sons retired to Geneva, where François was gratuitously educated at the gymnasium. In 1805 he commenced legal studies at Paris, but gradually drifted into the literary profession. In 1812 he married Mlle. de Meulan, editor of the *Publiciste*, and became professor of history at the Sorbonne. On the fall of the Empire he obtained several public offices, such as councilor of state, and director general of the departmental and communal administration. In 1816 he published *Du Gouvernment Représentatif et de l'Etate actuel de la France*, and *Essai sur l'Instruction Publique.* In 1820 the Duc de Berry was assassinated, and Guizot's party fell before an ultra-royalist reaction. In 1829 he again became councilor of state, and in 1830 was elected deputy for the arrondissement of Lisieux. After the July revolution he was appointed minister of the interior, but resigned in 1831. After the death of Périer, Guizot, along with Thiers and De Broglie, formed a coalition ministry, and he rendered great service as minister of public instruction. He became ambassador at the British court in 1840, and next year he became the real head of the government of which Soult was the nominal chief. He retained the office of minister of foreign affairs until 1848, and during that period opposed all measures of reform. After the fall of Louis Philippe, Guizot escaped and fled to England. Henceforth he practically retired from public life. Among his numerous works may be mentioned, *Histoire de la Civilisation en France; Histoire général de la Civilisation en Europe; Histoire de la Revolution d'Angleterre; Washington; Discours sur la Révolution d'Angleterre; Méditations et Etudes Morales; Guillaume le Conquérant; Mémoires pour servir à l'Histoire de mon Temps* (1858–68)*; Méditations sur l'Etat Actuel de la Réligion Chrétienne; Mélanges Biographiques et Litteraire; Histoire de France Racontée à mes Petits Enfants.*

Gujerat (Gujarát or Guzerat), a maritime province in Western Hindustan, presidency of Bombay; total area 70,038 sq. mi.; pop. 9,779,780. The climate is very hot in summer, and during the hot months the surface mostly appears sand or dust, and in the rainy season a thick mire; but it is extremely fertile. The population presents an extraordinary assemblage of sects and castes. It gives name to the vernacular language of Northern Bombay—Gujaráti. The area of the British portion, comprising the districts of Surat, Broach, Kaira, Panch Mahals, and Ahmedabad is 10,158 sq. mi., and the pop. 2,857,731.

Gujrát, a district of India in the lieutenant-governorship of the Punjab, in the Rawál Pindi division between Jehlam and the Chenab. Pop. 689,115. Gujrát, the capital, 5 mi. from the Chenab, is a commercial center. Its manufactures are principally of cotton and of Gujrát ware, that is, inlaid work in gold and iron. Pop. 18,743.

Gulden, a silver coin of Austria-Hungary and also of Holland, worth about 40 cents. Also called a *florin.*

Gulf Stream, one of the most celebrated of the oceanic currents, so called because it issues from the Gulf of Mexico. It owes its origin to the fact that the westward-moving waters of the tropical portion of the Atlantic, encountering the eastward projection of South America, become divided into two currents, one setting southward along the Brazilian coast, and the other northward past the mouths of the Amazon and Orinoco, into the Caribbean Sea. It then enters the Gulf of Mexico, and thence emerges through the channel of Florida as the Gulf Stream. Its course is next to the north and eastward, in a direction parallel to the coast of the U. S., past Cape Hatteras (lat 35° 13′), along the southern edge of the "great banks" of Nantucket and Newfoundland (between the meridians of 48° and 60° west), after which its course as a distinct current cannot be traced. In the earlier part of its course, especially when rounding the ex-

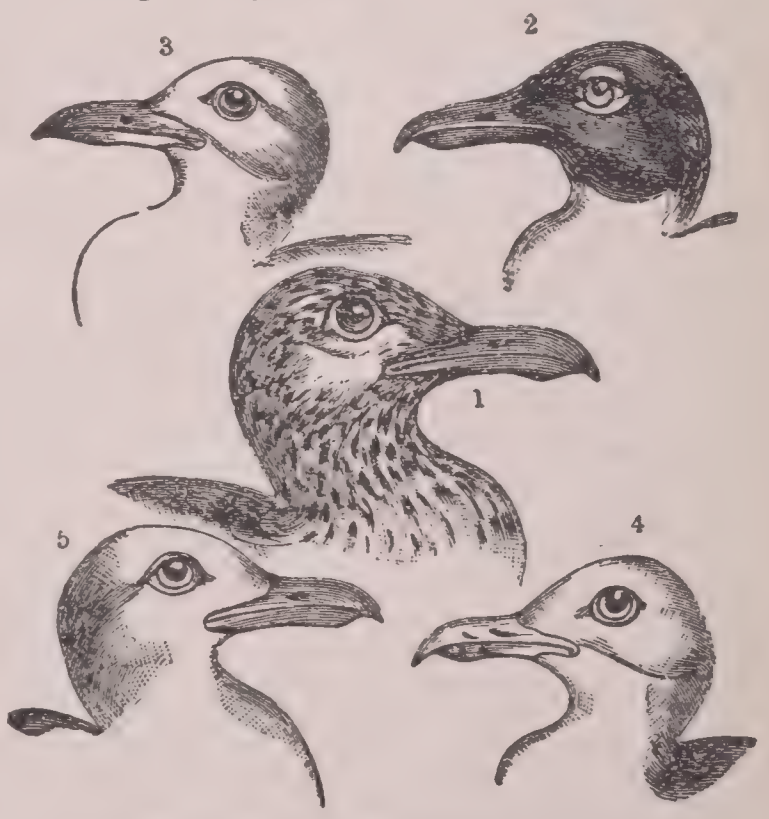
tremity of Florida, the Gulf Stream forms a well-defined current, distinguished by its high temperature and its deep blue or indigo color. On account of the descent of the Polar or Baffin's Bay current along the coast in a direction opposite to that of the Gulf Stream, the water on its inland side is colder than that to the eastward of it. The difference of temperature between the Gulf Stream and this cold current sometimes amounts to 20° (or even 30°) F. The velocity of the Gulf Stream varies with its course. Within the Florida channel it attains a mean of 65 mi. per day, this sinks to 56 mi. off Charleston, becomes 36 mi. to 46 mi. off Nantucket, and 28 mi. to the south of the Newfoundland Banks; 300 mi. to the eastward of Newfoundland its movement is hardly perceptible. At the bottom of the Florida channel the observed temperature is 34°, that of the surface from 80° to 84°. Geographers have greatly exaggerated the influence of the Gulf Stream on the temperature of Europe. If it possesses any *direct* influence such must be extremely small, as the current is both too narrow and too shallow, and its slight amount of superior heat probably vanishes after it has passed Cape Hatteras. The relatively high temperature of western and northwestern Europe must rather be referred to the general set of the tropical waters to the northeast, and to the warm winds blowing in the same direction, and not the Gulf Stream exclusively.

Gulf Weed, a genus of seaweeds (Algæ) suborder Fucaceæ, of which one species exists to an enormous extent in the tropical seas. It floats on the surface, and is propagated by buds. It derives its ordinary appellation from the exploded idea that it is borne on the Gulf Stream from the Gulf of Mexico. Several areas of the ocean exhibit great quantities of this and other weeds floating on the surface. One such, the Sargasso Sea, is in the North Atlantic, lying s. w. of the Azores, and n. of the tropic of Cancer.

Gull, the general name of a family of birds distinguished by their straight bill,—bending downward toward the point, and marked below the under mandible by a triangular prominence,—by their large wings, slender legs, palmated feet, and small hind toe. Generally seen in large flocks, the larger species frequent the sea, the smaller, lakes or rivers. They swim well, but are incapable of diving. Their flight is rapid and long sustained. They are extremely voracious, and feed on every kind of animal food, putrid or fresh. Their principal food is fish, which they catch with great agility, darting down like an arrow. They breed only once a year, laying two to four eggs. The species are extremely numerous, and resemble each other greatly. Among the principal are the common gull, which breeds on the coast, or inland in moory districts; the lesser black-backed gull; the black-headed gull, of which the masked gull is only a variety; the ivory gull; the Iceland gull, distinguished by its white quill feathers from the herring gull; the great black-backed gull; the burgomaster; the little gull; sabine's gull; the kittiwake, etc.

Gum, a substance of various properties which exudes spontaneously from the bark of certain trees, such as the plum, the peach, etc.; or from incisions made in the bark to facilitate the flow. Gums form non-crystalline rounded drops or tears, the purest varieties being transparent or translucent, of a pale yellow, but sometimes of a dark color. When dissolved in water gum forms a thick, smooth fluid, with considerable viscosity. Some gums, such as gum-arabic, dissolve in water; others, like tragacanth, are only partially soluble; they are insoluble in alcohol. By being insoluble in alcohol gums are distinguished from resins. They have no odor, and only a very faint taste. The different kinds of gum receive their names from the countries from which they are imported—such as gum arabic, gum Senegal, Barbary gum, East India gum, etc., and from individual features, as cherry-tree gum, tragacanth, etc. *Gum resins* require water and alcohol to dissolve them.

Gum Arabic is the purest form of gum, and may be regarded as typical. It comes from various species of Acacia. The gum exudes spontaneously, and its appearance is an indication of the tree being in an unhealthy condition; but in order to get it in sufficient quantity incisions are made in the bark. Gum arabic is very largely employed in the finishing and dressing of fabrics; for thickening the colors in calico printing; in pharmacy; as a cement; in ink making; for making crayons and water color cakes; and many other purposes. The purest gum arabic is in round tears, transparent, and almost colorless, faintly odorous, completely soluble in water, the solution being feebly acid.



Heads of Various Specimens of Gulls:
1, Great Black-backed (young); 2, Black-headed; 3, Kittiwake; 4, Lesser Black-backed; 5, Herring Gull.

Gumboil, an abscess in the gum, generally the result of toothache or of the presence of decayed teeth or stumps. The carious tooth or stump, if the inflammation proceeds from this cause, should be removed. The purulent

matter should be evacuated by a free incision, and the mouth frequently washed with tincture of myrrh and water.

Gum Resins, solidified juices obtained from plants. They contain a gum, which is soluble in water, and a resin, which dissolves in spirit, so that the body usually is nearly quite soluble in dilute alcohol; but there are usually present in addition essential oil, and a variety of impurities. The gum resins have frequently a strong and characteristic taste and smell. They are solid, opaque, and brittle. The common gum resins are aloes, ammoniacum, asafœtida, bdellium, galbanum, gamboge, myrrh, olibanum, opoponax, sagapenum, and scammony.

Gumti (or Goomti), a river of Hindustan, rises in the Northwest Provinces, and flowing s.e. falls into the Ganges between Ghazipur and Benares. In its course it passes the cities of Lucknow and Jaunpur. Length about 500 mi.

Gunboat, a term applied to small war vessels mounting usually a single gun, and employed in coast defense or in attacking large and heavy armored vessels. Some gunboats are armed with one heavy deck gun, which can be turned in any direction by means of a pivot. In others the single gun is placed on a platform, which can be raised to the deck or lowered to the hold by a donkey engine. The gun in this case does not turn on a pivot, the manœuvering being effected entirely by the turning of the vessel. Steam gunboats, especially when iron plated, are most powerful auxiliaries to a fleet.

Gun Carriage, the structure on which a cannon is mounted, and on which it is fired. Gun carriages are of very various constructions. In the case of a field or siege piece the carriage is united, for traveling, with a two-wheeled fore-part, termed a *limber*, to which the horses are attached, so as to form a single four-wheeled carriage. In action the gun is unlimbered, and then rests on its pair of wheels, and on a strong support termed the *trail.* A gun in a fortress has its carriage commonly mounted on what is termed a *traversing platform*, that is, a strong framework supported on metal trucks or small wheels. These trucks are constructed to run on metal rails, which are laid in concentric arcs of circles, whose centers are a real or imaginary pivot close to the mouth of the embrasure through which the gun fires. By this means the muzzle of the gun, when run up, is brought nearly over the pivot, so that the direction of its fire may be altered laterally considerably, and yet allow of a very narrow embrasure. Carriages on the "disappearing principle," are visible to the enemy only during the acts of aiming and firing. The loading is effected under shelter. In one of these the carriage is so contrived that a heavy counterweight attached to it is sufficient to raise the gun into the position for firing, the sides of the carriage having some resemblance to the "rockers" of a rocking-horse. The recoil brings the gun down into the loading position, after which it is again brought into firing position as before. The iron carriages now made are thus elaborate mechanical structures. In mortars a cast-iron bed takes the place of a carriage.

Gun Cotton (or Pyroxyline) is an explosive substance formed by the action of nitric acid on cotton. In the process of manufacture, sulphuric acid is mixed with the nitric, its function being to absorb the water formed by the weakening of the nitric acid as it gradually combines with the cotton. The product of this process is a chemical compound of four or five times the explosive power of gunpowder. The cotton is generally reduced to a finely divided condition, and the gun cotton molded into disks of suitable sizes. When ignited in a free state it burns with a strong flame; it is only when fired by a detonating fuse or when heated in confinement that it explodes. The presence of water and other substances does not interfere with this kind of explosion. From this follows the important fact that it can be kept wet with safety while in a condition in which it may be exploded by means of a detonator. *In short, when wet it is quite safe, and yet quite ready for work at a moment's notice;* for, while it refuses to burn even in the heat of a powerful flame, the application of a large or of a small detonator inserted in one dry disk of gun cotton causes the wet mass to explode with its full violence. Bursters of gun cotton and water have been used in shells for certain purposes. When exploded it produces little smoke and a very small amount of residual matter. There are also preparations allied to gun cotton with wood-fiber as a basis, such as Schulze's powder, sawdust powder, etc. An imperfect chemical form of gun cotton termed collodion, soluble in a mixture of ether and alcohol, is used in photography.

Gunnera, a genus of plants of the bread fruit order, one species of which, a native of South America, somewhat resembles the rhubarb, and is used as an ornamental plant. It has large, rough leaves, astringent roots, while its leaf-stalks are a substitute for rhubarb.

Gunnery, the science of conducting the fire of artillery. Gunnery may be divided into the theoretical and practical branches. The former consists chiefly in the application of mathematics to the solution of the problems in dynamics involved in the consideration of the motion of shot through the air, and is essential to the design of good systems of rifling and well-proportioned projectiles. Practical gunnery, which deals with the actual firing, has reference rather to the use of individual guns than to the handling of artillery on a large scale. Theoretical gunnery would be simple were the projectiles fired in vacuo, as gravity alone would, in such a case, require to be taken into account, and the path of projectiles would simply describe a parabola. Among things to be considered in gunnery are the *velocity* of the projectile, initial and subsequent, the *angle of elevation* of the piece, the *range* or distance to which the projectile is carried, etc. With cast-iron spherical shot the chief complication arises from the center of gravity never falling

exactly in the center of the figure. Rifled guns, however, fire projectiles with a *certain known rotation*, and in the case of elongated shot, these are more accurately centered in the bore by the action of the grooves, and possess the faculty of traveling point first, and of thus overcoming the resistance of the air. The most approved projectiles have their centers of gravity nearly half way along their axes, and in flight they carry toward the right hand of the person laying the gun, a species of deviation to which the name of *drift* or *deflexion* is given. The recoil of a gun must necessarily diminish the velocity of its projectile; and this has been carefully borne in mind by men who have made gunnery their especial study. In ordinary artillery fire and charge is a fixed one, and the elevation is varied according to the range. Horizontal fire against the front of a column or line of works is termed *direct fire;* that which sweeps along a line of men or earth works, *enfilade fire; vertical fire* is when the piece is fired at a high angle of elevation.

Gunny Bags are made of a coarse cloth or sacking manufactured in India of some native fiber, chiefly jute. They are extensively used in packing rice, sago, spices, etc., for export, and in America for bales of cotton.

Gunpowder is a mixture of saltpeter, sulphur, and charcoal. We hear of gunpowder from a very early period. It appears to have been used in China at, if not before, the Christian era. Marcus Græcus, who lived about the ninth century, described its composition, which was also known to Roger Bacon, who refers to it in 1267. It was also apparently known to the Arabs at an early period. In 1342 the Moors employed it in the siege of Algesiras. According to the common story, the discovery of its propulsive power was due to the German monk Barthold Schwartz, between 1290 and 1320. Guns are said to have been employed by Edward III, in 1327, on his invasion of Scotland. It is also asserted that gunpowder was employed in 1346 by the English at Crécy. It was not, however, until the sixteenth century that its use in warfare became general. The proportion of the ingredients in the composition of gunpowder is different in different countries. It is a combination of saltpeter, charcoal, and sulphur in various proportions. Theoretically, military gunpowder has 74.84 parts of saltpeter, 11.84 parts of sulphur, and 13.32 parts of charcoal; rifle powder, 75.7 parts saltpeter, 9.9 parts sulphur, and 14.4 parts charcoal; blasting powder, 64.4 parts saltpeter, 20.4 parts sulphur, and 15.2 parts charcoal. The pressure generated by the combustion of powder is variously estimated at from 4,000 atmospheres for rifle powder, the strongest in saltpeter, to 2,000 atmospheres for blasting powder, the weakest in saltpeter. Gunpowder explodes because the oxygen in the saltpeter combines in burning with the carbon of the charcoal, forming carbonic acid gas in a highly condensed state. In expanding, the gas hurls the projectile from the gun. Powder is a comparatively slow-burning explosive, and that is what makes it valuable for

artillery use. Saltpeter, as it comes to the powder mill, is usually more or less impure, and a refining process is necessary before it is fit for use. The "grough niter," as it is called, is placed in huge copper vats and treated with hot water. The whole mass quickly dissolves, and the sand and other heavy impurities sift down through holes in the bottoms of the tanks into long iron drawers. As the liquid is kept boiling, a thick, soapy scum forms at the top, composed largely of impurities, and it is carefully skimmed off with a ladle. Occasionally water is dashed in and the liquid again raised to the boiling point, in order to induce as much scum as possible to rise. The solution is allowed to cool down and crystals of saltpeter, pure and white, begin to flake the sides of the tank. All the other saline salts being quite as soluble in cold water as in hot, remain suspended in solution, and when the sides of the tank are thickly crusted, the workmen shovel out the saltpeter. When the solution has cooled to 70°, the impurities, common salt, and chloride of potassium begin to crystallize out, and the collection of saltpeter has to stop. The "flour," as the crystals are called, receives several washings with clear, cold water, and is ready for use.

The first process in powder making is the weighing out and mixing of the ingredients. Charcoal and sulphur are put together in the right proportions, and thoroughly pulverized by placing them in swiftly revolving barrels with a number of small iron cannon balls. Thus in rubbing against the sides of the barrel and being ground between the balls, the mixture becomes homogeneous and very fine. It is then taken out, and the proper amount of saltpeter is added. The charge is again put in the barrels, this time with copper or zinc balls instead of iron, because they are much less likely to ignite the powder. After having been rolled for several hours the mass is taken out and moistened to prevent accident. It is then taken to the crushing mills. Crushing or grinding mills consist of large basins usually made of smooth limestone. From the center a shaft rises and fastens to the axle of a huge stone wheel weighing 24 tons. The machinery for operating the shaft is usually hidden away underground, where it will be uninjured in case of accident. When the powder has been spread over the bottom of the basin and moistened a little, the great chaser begins to roll over it, crunching and kneading it. At one side of the wheel is a sort of plow which roots up the powder after the wheel crushes it down. The workmen are around only from time to time when they moisten the charge. In case of explosion there is an automatic device which will let a whole tank of water down over the wheels, thus aiding in extinguishing the flames. It requires about eight to sixteen hours to make the mass uniform in composition. It is then removed and carried to the "breaking-down" machines by means of an endless canvas belt having strips of leather sewed across it. Here it passes between two sets of copper rollers, which will spring apart if the pressure is too great between them. It

sifts from the lower end of the machine like fine dust or meal into trucks in which it is trundled away to an ordinary hydraulic press, in which the powder can be absolutely controlled by a movement of the finger. The meal is stacked into the form of a great cheese 2 or 3 ft. in diameter and 3 or 4 ft. high, consisting of layers of powder 1 or 2 in. thick, separated by disks of copper or vulcanite. Then the piston begins to strain upward out of the water, and the powder is reduced nearly one half in thickness, the cakes being a dark gray, hard and lusterless. The pressure given is one of the most important considerations in the process of powder manufacture, the ultimate density of the powder being determined by it, and this in turn determining the rate of combustion. By merely varying the degree of pressure the powder may be made violently explosive or mild and easy in its action. The cakes of powder are then carried along on a granulating machine. This consists of a series of copper rollers separated by screens of varying sizes and meshes. After being crushed through the first set of rollers the finest powder falls through the screen, and the rest is shaken down to the second set, and so on to the end, where the powder pours from the various screens into trucks. The grains thus obtained are sharply angular, and require rounding and smoothing to prevent their fine edges from being ground into dust by handling and transporting. While still moist the granulated powder is put into rolling barrels, where it is revolved from six to twenty-four hours. The friction of grain upon grain wears it perfectly smooth. The last operation—drying—takes place in a long, low room heated to a temperature of 130° to 140°. Gunpowder is classified according to the size of the meshes through which the grain is sifted. The U. S. government designates it as musket, mortar, cannon and mammoth powder. Some other kinds of powder are cut or molded by pressure into various shapes and sizes, the grain often being two inches square. Others for artillery use are the shape of iron washers, and have a hole in the middle. These are made larger and pressed more compact so they will burn with less rapidity. In big guns the use of small-grained powder causes so great an initial strain before the projectile is started that a good deal of force is lost.

Gunpowder Plot, a conspiracy formed in England in 1604, the second year of the reign of James I, by some Roman Catholics, to blow up the king and Parliament in order to be revenged on the government for the severities against their religion. The time ultimately fixed for the execution of the plot was Nov. 5, 1605, when Parliament was to be opened by the king in person. The plot originated with Robert Catesby, Guy Fawkes, and others. The conspirators took a house next the Parliament House, and their original plan was, by digging under this house, to undermine the House of Parliament. They latterly discovered, however, that there was a cellar right under the chamber of Parliament,

which was occupied by a coal dealer. They at once hired this cellar, and filled it with powder, faggots, and billets. The plot was discovered by means of a letter sent Lord Monteagle, a Catholic peer in favor with the court, who laid it before the secretary of state, Cecil. It was a warning couched in mysterious terms, not to be present at the approaching meeting of Parliament. Cecil showed it to some of the council, and did nothing till the return of the king from a hunting party. On hearing the letter James at once divined its meaning, and declared that it referred to gunpowder. This led to investigation and to the arrest of Fawkes in the cellar, where a hogshead and thirty-six barrels of powder were discovered. Fawkes, Rookwood, Winter, and others were tried at Westminster, Jan. 27, 1606, and executed on the 30th and 31st.

Gunter, EDMUND (1581–1626), an English mathematician who flourished in the reign of James I, and invented the instruments mentioned in following articles, as also the sector. He was educated at Oxford, and became professor of astronomy in Gresham College, London, in 1619. He was the first to employ the terms *co*sine, *co*tangent, etc.

Gunter's Chain, the chain in common use for measuring land; so called from its inventor, Edmund Gunter. Its length is 66 ft., or 22 yds., or 4 poles of 5½ yds. each; and it is divided into 100 links of 7.92 in. each; 100,000 sq. links make 1 acre.

Gunter's Scale, a scale having various lines upon it, of great use in working problems in navigation. This scale is usually 2 ft. long and about 1½ in. broad. On the one side are the natural lines, and on the other the artificial or logarithmic ones.

Gustavus I (1496–1560), commonly called *Gustavus Vasa.* He was the son of Eric Johansson, a Swedish noble, served under Svante Sture, the administrator of the kingdom, was treacherously carried off with other noble Swedes by the king of Denmark, and kept a prisoner in Jutland for more than a year, but at length escaped, reached, after many dangers, Dalecarlia, where he roused the peasants to resist Danish oppression, defeated the Danes, took Upsala and other towns, and in 1523 was elected king. In 1529 he procured the abolition of the Roman Catholic religion in Sweden, and established Protestantism. During his long reign Sweden made great progress in commerce and civilization.

Gustavus II (Gustavus Adolphus) (1594–1632), king of Sweden, a grandson of Gustavus Vasa. He was trained to war under experienced generals, took his place in the state councils at the age of 16, and was in command of the army in his seventeenth year during the war with Denmark, which was concluded in 1613, and by which Sweden recovered important possessions on the Baltic. He then turned his arms against the Russians, drove them from Ingria, Karelia, and a part of Livonia, which were secured to him by the peace of Stolbova in 1617. He was then engaged in a war with Poland, which lasted nine years, and

was concluded on advantageous terms for Gustavus in September, 1629, he being allowed to retain important conquests in East Prussia. His attention was now diverted from northern wars by the affairs of Germany. The oppression of the Protestants by Ferdinand II excited his sympathy, and the progress of Wallenstein alarmed him. Probably also he was moved by the ambition of foreign conquests. He embarked for Germany in 1630 with 20,000 men, landed near the mouth of the Oder, and in a short time had seized nearly all of Pomerania. After taking many fortified towns, repeatedly defeating the imperial generals at Leipsic (1631), Würzburg (1631), Passage of the Lech (1632), and conquering a great part of Germany, he was killed in the battle of Lützen, against Wallenstein, Nov. 16, 1632. See *Thirty Years' War*. Though a severe disciplinarian, he was beloved by his soldiers, and the prestige of success derived from his victories lasted long after his death.

Gustavus III (1746–1792), king of Sweden, succeeded his father, Adolphus Frederick, in 1771. Finding the country weary of the misrule of the nobles, he gained the good will of the army, surrounded the assembly of the states-general, and forced them to accept a new constitution which much restricted their privileges. In 1788 he took command of the army against Russia and Denmark, and stormed the defences of Frederickshall, destroying a great number of vessels. In 1789 he executed another *coup d'état*, arresting the opposition leaders, and passing a law extending the royal prerogative. On the outbreak of the French Revolution he made strenuous exertions to form a coalition between Russia, Denmark, Sweden, and Spain, but, while preparations were making, a conspiracy of the nobles was formed against him, and he was shot at a masquerade by Ankarstroem, a disbanded officer, on March 16, 1792.

Gustavus IV (Adolphus) (1778–1837), king of Sweden, succeeded his father, March 29, 1792. On assuming power Gustavus showed that he had inherited his father's hatred of the principles of the French Revolution, which he carried to the extent of fanaticism. After the Peace of Tilsit he exposed himself to a war with Russia while he was at war with France, by refusing to join the continental blockade and opening his ports to England; and in 1808 he quarreled with England, his only ally. Finland was lost to Sweden, and in 1809 a revolution took place. Gustavus was dethroned, and his uncle, the Duke of Sudermania, proclaimed king under the title of Charles XIII.

Gutenberg, JOHANN (1400–1468), the inventor of printing with movable blocks. His original name was Johann Henne Gensfleisch; Gutenberg was probably his mother's family name. Of the details of his life, apart from the invention which has immortalized him, but little is known with certainty. He was b. in Mainz of noble family, and was a prominent man in his native city until, about 1420, he was with others obliged to leave on account of civic dissensions. He is next heard of in

Strassburg in 1434. The principal evidence in support of his claim to the invention of printing is a legal decision of the Strassburg courts in 1439, wherein it appears that he had formed a partnership with one Andrew Dritzehn to practise certain arts, connected with which were a press and what is believed to have been a type-mold. In 1448, Gutenberg was again in Mainz. In August, 1450, he formed a partnership with Johann Faust (or Fust), a moneylender who was to furnish the capital for carrying on the business of printing. After five years Faust sued for money advanced and got possession of most of the printing outfit. Gutenberg pursued his work with inferior types, afterward having as a partner Dr. Conrad Homery. In 1465 he gave up printing and entered the service of the Elector Adolphus of Nassau as a gentleman of the court. In his native city, not far from the cathedral, stands a bronze statute by Thorwaldsen, erected to his memory in 1837. As Gutenberg's name did not appear on any of his printed works, it has been difficult to identify them. He is believed to have published one or more books in Strassburg. The most famous of the books known to have been published during his partnership with Faust is the *Mazarin Bible*. Faust and his son-in-law, Peter Schöffer, continued the business and claimed the credit of the invention, but the latter's son, Johann Schöffer, states in a preface of 1505 that the "admirable art of printing was invented in Mainz in 1450 by the ingenious Johann Gutenberg, and was subsequently improved and handed down to posterity by the capital and labor of Johann Faust and Peter Schöffer." Gutenberg's great service was that he first separated the letters, and so was able to use movable blocks. Impressions for playing cards, religious pictures, and even whole books, consisting of a few pages, had been made on wood, and the use of engraved seals and blocks is as old as civilization, appearing even among the ancient Chinese, the Chaldeans, and Babylonians. Gutenberg probably used only wooden types, but these were soon replaced by metal, first cut by hand and afterward punched.

Guthrie, Logan co., O. T., capital of the territory. Surrounding country agricultural. Railroad, A. T. & S F. Pop. est. 1897, 7,600.

Gutta-percha (pĕr'cha) (Malay name, meaning "gum-tree"), a substance resembling caoutchouc in many of its properties, but stronger, more soluble, and less elastic. It is the inspissated milky juice of *Isonadra Gutta* and other kindred trees of the nat. order Sapotaceæ. It chiefly comes from Malacca, Borneo, and other islands of the Indian Archipelago. When pure, gutta-percha is of a brownish-red color. Below the temperature of 50° it is as hard as wood and excessively tough. By an increase of heat it becomes more flexible, until a temperature of 115° F. it becomes pasty, and between this and 140° or 150° it may be molded into all varieties of forms with the greatest ease, retaining precisely the same form as it cools and hardens to its previous state of rigidity. It is insolu-

ble in water, soluble with difficulty in ether and other caoutchouc solvents, but very readily in oil of turpentine and naphtha. It is not attacked by solutions of alkalies nor by hydrofluoric acid, but it is acted on by sulphuric, nitric, and hydrochloric acids. Gutta-percha has been applied to a variety of purposes, as a substitute for leather, especially in the soles

Gutta-percha; *a.*—flower; *b.*—fruit.

of shoes, etc., as an insulating coating for the copper wires of submarine telegraph cables, as an ingredient in mastics and cements, for the manufacture of flexible hose tubes, bottles, etc.

Gutzkow (gu̇ts'kō), KARL FERDINAND (1811–1878), German writer, b. at Berlin in 1811. After studying theology he took to journalism and politics, and became the leading spirit of a small body of reformers known as "Young Germany." In 1835 his novel *Wally die Zweiflerin* appeared. It was at once confiscated by the government as hostile to religion and society, and the author was imprisoned for three months. He was active, also, in dramatic literature, his tragedies *Richard Savage*, *Patkul*, and *Uriel Acosta*, and his comedies *Topf und Schwert*, and *Das Urbild des Tartufe*, having been very popular. He also wrote several novels, producing the romances *Die Ritter vom Geist*, *Der Zauberer von Rom*, and *Hohenschwangau*.

Guy of Warwick, an old English metrical romance, whose hero is an Anglo-Danish knight said to have been the son of Siward, baron of Wallingford, to have become earl of Warwick, and to have slain in single combat the Danish giant Colbrand, the Dum-Cow of Dunsmore, and the dragon of Northumberland, and many other wonderful feats. He is said ultimately to have become a hermit in Warwick.

Guyot (gē-yo), ARNOLD (1807–1884), geographer and physicist, b. in Switzerland, d. in the U. S. He studied theology at Berlin, then took up natural science, and became professor of history and physical geography in the Academy of Neufchâtel. He shared in Agassiz's investigations of glacier phenomena of the Alps. In 1848 he emigrated to the

U. S. and delivered lectures in Boston, which afterward appeared under the title *Earth and Man*. He rendered much service to meteorological science in connection with the Smithsonian Institution, and traveled extensively in the U. S. In 1855 he was appointed professor of geology and physical geography in the College of New Jersey, Princeton.

Gwal'ior, a city and fortress of Hindustan, capital of the state of Gwalior, situated 65 mi. s. from Agra. The fortress is the largest, the strongest, and the most magnificent in India. It stands on an isolated rock about 350 ft. high and nearly perpendicular in the upper part. The fortress contains wells and reservoirs of water, and is inaccessible except by steps up the side of the rock. Old Gwalior, the town at the northern angle of the base of the rock, is built of stone, and has some remarkable ruins of temples, and an interesting example of old Hindu palace architecture. Pop. about 25,000. The new town, known as New Gwalior or Lashkar (the camp), the residence of the ruler, Maharajah Sindhia, has sprung up recently on the s.e. skirt of the rock, but is already a flourishing city with a pop. of 104,083, of whom about 70,000 are Hindus. The state of Gwalior, in political relationship with the government of India, consists of several portions of territory, otherwise known as Sindhia's Dominions, the largest and most compact portion usually known as Gwalior, being the one containing the above town and fortress. The total area is 25,855 sq.mi. It is not as a whole very fertile; one of its most notable products is opium. Pop. 3,378,774.

Gymna'sium (jim-), the name given by the Greeks to the public building where the young men, quite without clothes (hence the name, from *gymnos*, naked), exercised themselves in leaping, running, throwing the discus and spear, wrestling, and pugilism. Its objects, however, were extended also to the exercise of the mind; for here philosophers, rhetoricians, and teachers of other branches of knowledge delivered their lectures. Gymnasia were at first only open level places, surrounded by a wall, and partitioned off for the different games. Latterly they were composed of a number of connected buildings, spacious enough to admit many thousands.

Gymnasium, a term applied in Germany to a class of schools occupying a middle place between elementary schools and universities. The gymnasia are the feeders of the universities, and the training adopted in them is specially intended to equip the pupils for entering these institutions. The last or exit examination, to show whether the pupils are fit to enter the university, is very severe, and includes history, Latin, and Greek, and at least one foreign language.

Gymnastics (for derivation, see *Gymnasium*), is the technical term used to designate any system of exercises specially designed to promote the development of physical, and especially of muscular powers. An excellent gymnastic training is given by baseball, football, rowing, and similar amusements, but the spe-

cial value of formal gymnastic exercises is that they are capable of being scientifically arranged so as to secure not only a general development of muscular power, but also an accurate knowledge of the uses of the various muscles, and further that they are capable of being applied to each individual case, so as to meet, allow for, and as far as possible overcome defects in physical organization. For these purposes an elementary course of gymnastics is of great value to all, especially to the sedentary student. In regard to gymnastic exercises, two general rules may be laid down, which will form an efficient guide in self-imposed exercises. The first is the universal rule in mechanics that the strength of any machine is the strength of its weakest part; the second is the fundamental law of muscular exercise, that it is exercise *within* the extreme power of the muscle which develops and improves, while *straining* weakens and injures, and excessive exercise develops particular muscles abnormally at the expense of the general health. It is quite possible, indeed, to carry physical exercises as a whole too far, and to develop muscular power at the expense of vital strength. Till the age of twelve the ordinary games and pastimes of childhood are generally quite sufficient exercise; after that some very light system of gymnastics may be adopted to aid the development of the system. After the age of thirty-five unusual muscular efforts are apt to leave persistent strains, and moderate exercise becomes the safest means of developing and giving tone to the muscular system.

Gypsies, a wandering nation, whose physical characteristics, language, and customs differ much from those of European nations. They are called by the French *Bohémiens*, from the belief that they were Hussites driven from Bohemia; in Germany the general name is *Zigeuner*, which is not unlike the Italian *Zingari*. They call themselves *Rommany*, from *rom* (man). This race is slowly melting away. Its present total number hardly reaches 500,000. The gypsies are now considered to have come from India, the main body of their language, though mixed with a great number of borrowed words, having a close affinity with some of the Indian languages. Gypsies are remarkable for the yellow brown, or rather olive color, of their skin, the jet-black of their hair and eyes, the extreme whiteness of their teeth, and generally for the symmetry of their limbs. The typical gypsies rarely settle permanently anywhere, but live in tents, wandering about working in wood and iron, making domestic utensils, telling fortunes, practising tricks, etc. Their talent for music is remarkable, and some of their melodies have become the much-valued property of other nations, or are incorporated in some of our favorite operas. They have no peculiar religion. The marriage ceremony is of the simplest kind. If the husband becomes tired of his wife, he will turn her off without ceremony. There is no idea of education among them. The children grow up in idleness and the habits of stealing and cheating. In England the gypsies first appeared about the beginning of the sixteenth century, and notwithstanding severely repressive enactments on the part of the government continued to maintain themselves as tinkers, mat and basket makers, etc. Considerable numbers of the British gypsies have emigrated to America where they settle among the people and lose their distinctive characteristics. With regard to their language, a large number of the words in all the different dialects are of Indian origin, as already mentioned. The grammar of the tongue is also Oriental, and corresponds with the Indian dialects. This similarity cannot be considered the work of chance, particularly as their persons and customs show much of the Hindu character.

Gypsum (jip'sum), a monoclinic mineral, chemically a hydrated calcic sulphate. It is found in a compact state as *alabaster*, or crystallized as *selenite*, or in the form of a soft, chalky stone, which in a very moderate heat gives out its water of crystallization, and becomes a very fine white powder, extensively used under the name of plaster of Paris. This last is the most common, and is found in great masses near Paris; large beds are also found in Nova Scotia, Virginia, Michigan, New York, and Ohio. Gypsum may be geologically of any age, but occurs abundantly in the more recent sedimentary formations, and is even now forming, either as a deposit from water holding it in solution, or from the decomposition of iron pyrites when the sulphuric acid combines with lime, or from the action of sulphurous vapors in volcanic regions on calcareous rocks. When gypsum occurs without water it is called *anhydrite*, but in its most ordinary state it is combined with water. Gypsum, pulverized by grinding or burning, has been used with good effect as a manure, especially as a top dressing for meadows.

H

H, the eighth letter of the English alphabet often called the *aspirate*, as being a mere aspiration or breathing, though not the only aspirated letter in English. The sound that distinctively belongs to it is that which it has at the beginning of a syllable before a vowel, as in *hard*, *heavy*. It is very commonly joined to other consonants to represent sounds for which there are no special letters in the alphabet, as in the digraphs *ch*, *sh*, *th*, (*child*, *ship*, *thin*, *this*), or in other consonantal combinations of various origins and values, as in the words *enough* (*gh*=*f*), *plough* (*gh* silent), *philosophy* (*ph*=*f*), *rhetoric* (*h* silent), etc. *Ch* is common in words taken from the Greek, but in this case it generally has the *k* sound, as in *chemistry*, *chyle*, *logomachy*, etc.

Haarlem (här'lem), a town of Holland, province North Holland, 10 mi. w. Amsterdam, The manufactures of Haarlem, as well as its population, are less than what they were formerly; but it has still various industrial works, a celebrated type-foundry, the oldest and most famous printing office in Holland, and its flower trade, especially in hyacinths and other bulbs, is very important. It is the birth-place of Laurence Coster, supposed inventor of movable types, and of a number of painters, Ostade, the Wouvermans, Ruisdael, Van Loo, etc. Pop. 46,730.

Habak'kuk, the eighth of the twelve minor prophets. He flourished about 600 B. C. at the time of the invasion of Judah by the Chaldeans, against whom he prophesies God's retributive justice. He concludes with kind of psalm (chap. 3) remarkable for the majesty of its language and the sublimity of its thought.

Habeas Corpus, in law, a writ addressed to one who has a person in custody, commanding him to produce the body of the person named at a certain place and time. The protection of *habeas corpus* is secured to American citizens by the Constitution of the U. S., and by the constitution of most of the states. The state courts do not discharge persons imprisoned by order of federal courts, nor will the federal courts interfere with persons imprisoned under state process.

In times of rebellion or disturbance the government may find it necessary to arrest dangerous persons, and to detain them in custody without bringing them to trial. In such cases the government may either break the law and apply to Parliament for an act of indemnity, or it may invite Parliament to suspend the *habeas corpus* act for a time. In 1881, for example, the Irish government was empowered to detain without trial all persons reasonably suspected of complicity in treason and crime. In the U. S., Merryman's case, in 1867, gave rise to a keen discussion, some eminent lawyers maintaining that the president, of his own authority, could suspend the law of *habeas corpus*, others contending that the power of suspension could only be exercised by Congress.

Hackensack, Bergen co., N. J., on Hackensack River, 11 mi. n. of New York. Railroads: Erie, and N. Y. S. & W. Industries: silk and other factories. The town was first settled in 1773, and became a city in 1841. Pop. 1900, 9,443.

Haddington, a royal burgh of Scotland, capital of the county of same name, 17 mi. e. by n. of Edinburgh, on the Tyne. Pop. 4,043. The county, also called East Lothian, area 280 sq. mi., of which four-fifths are arable or fit for cultivation. The surface rises gently from the coast toward the Lammermuir Hills, 500 to 1,700 ft. high, which form its south boundary. Fishing and fish-curing are carried on at Dunbar and other points. Pop. 37,491.

Haddock, a well-known fish of the cod family. It is smaller than the cod, which it much resembles, but it has a dark spot on each side of the body just behind the head. This fish commonly weighs from 2 to 6 lbs., though sometimes as high as 10 lbs. It breeds in immense numbers in the northern seas in February and March, and constitutes a considerable article of food. It is plentiful on the coasts of America, from New York to the Arctic regions.

Hades (hā'dēz), originally the Greek name of the lord of the lower or invisible world, afterward called Pluto; but in later times, as in the Greek Scriptures, it is applied to the region itself. With the ancients Hades was the common receptacle of departed spirits, of good as well as bad.

Hadj, the Mohammedan pilgrimage to Mecca, which every Mohammedan ought to perform once in his life, and after which he is entitled to prefix *Hadji* to his name. The pilgrimage has been made in disguise by Burckhardt in 1814, by Burton in 1853, and by T. F. Keane in 1878, each of whom has published accounts of his journey.

Hadley, Arthur T., b. in 1856. He graduated at Yale in 1876 and became professor of political science at the same institution in 1886. He became president of Yale, May, 1899, succeeding Timothy Dwight, resigned.

Hadley, John (1700(?)–1744), English astronomer, b. toward the end of the seventeenth century. He is the reputed inventor of the quadrant that goes by his name, though the honor is also claimed for Newton, from whom Hadley got a description of the instrument in 1727, and for Thomas Godfrey, of Philadelphia, who produced his instrument about the same time as Hadley in 1731. The Royal Society decided that Godfrey and Hadley were both entitled to the honor of the invention. Hadley also invented the sextant.

Ha'drian, in full, PUBLIUS ÆLIUS HADRIANUS (A.D. 76–138), the fourteenth in the series of Roman emperors. His father, who was a cousin to the emperor Trajan, died when he was ten years old, and left him under the charge of his illustrious kinsman. He married Sabina, Trajan's grand-niece, accompanied the emperor on his expeditions, filled the highest offices of state, and, on the death of Trajan, assumed the government as his adopted son (117). He made peace with the Parthians, renouncing all conquests east of the Euphrates, and bought off a war with the Roxolani by payment of a sum of money. From the year 121 he spent most of his time by visiting the various provinces of the empire. He traveled into Asia and Africa, and lived in Athens for three years. In 131 he promulgated the *Edictum Perpetuum*, a fixed code of laws, which forms an important epoch in the development of Roman law. In 132 the Jews revolted, and for four years carried on a bloody war, the only notable one of his long reign.

Hadrosaurus, a genus of large extinct reptiles, whose remains have been found in the newer cretaceous strata of the U S. It appears to have resembled the gigantic iguanodon of Europe in its enormous dimensions, herbivorous habits, and anatomical structure.

Hæckel (hek'l), ERNST, a German naturalist (1834–), b. at Potsdam, studied medicine and science at Berlin, Würzburg, and Vienna; traveled in Norway and Italy, became professor of zoology at Jena in 1865. Later he visited Spain, Egypt, India, and Ceylon to perfect his knowledge of natural forms. He is the most prominent exponent of the Darwinian theories in Germany. Among his works we may mention *The Radiolariæ* (1862), *The History of Creation* (1868), *Anthropology* (1874), *History of the Evolution of Man* (1875), *Collected Popular Discourses on the Development Theory* (1878–79), *Origin and Development of Animal Tissues* (1884), etc.

Hæmal Cavity, in anatomy, a term applied to the cavity which contains the great vein centers of circulation in the Vertebrata, together with the digestive and respiratory apparatus. The *Hæmal Arch* is the arch formed by the projections anteriorly of the ribs and the sternum from the vertebræ.

Hæ'matin (Hematine), the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hematox'ylin, the coloring matter of logwood, or *hematoxylon campechianum.* This coloring matter is a constituent part of all the colors prepared with logwood, and the changes which it undergoes by the action of acids and alkalies render it useful as a reagent to detect their presence.

Hæmog'lobin (Hæmoglob'ulin), the semifluid, or quite fluid matter of a red color contained in the red corpuscles of the blood. It can be resolved into an albuminous substance called globulin, and the coloring matter hæmatin.

Hag, the name of the fishes, which, with the allied lampreys, constitute the order of Marsipobranchii. They are of worm-like form, and have no eyes or scales. The mouth is formed for suction, is without lips, and furnished with fleshy filaments or barbels. There is a single median fang upon the palate by means of which the hag makes its way into the interior of other fishes, such as the cod, ling, or haddock, where it lives parasitically. The common hag takes its name from the quantity of viscid mucus which it can secrete. An American species is not uncommon in rivers of New York and New England.

Hagen, a thriving manufacturing town of Prussia, in Westphalia, at the confluence of the Volme and Ennepe. It has manufactures of woolen, linen, and cotton cloth, leather, hats, steel, and ironware. Pop. 29,614.

Hagerstown, Washington co., Md., on Antietam Creek, 60 mi. n.w. Baltimore. Railroads: Baltimore & Ohio, and three others. It is an active trade center, the principal industries being machine shops, iron foundries, spoke works, carriages, pottery, bricks, leather, and flouring mills. Pop. 1900, 13,591.

Haggai (hag'ā-ī), the tenth in order of the minor prophets, and the first of those who prophesied after the captivity. The book of Haggai consists of four distinct prophetical addresses—two in the first and two in the second chapter—intended to rouse his disheartened countrymen to the rebuilding of the temple. They were delivered in 520 B. C., and are written in a brief and meager style. The closing prediction foreshadows the establishment of the Messianic kingdom upon the overthrow of the thrones of the nations.

Haggard, H. RIDER, b. at Norfolk in 1856. In 1879 he began his literary career. Among his books are, *Dawn, The Witch's Head, Allan's Wife, Joan Haste,* and *Heart of the World.*

Hague, THE (hāg) (Dutch, *'S Gravenhage*—the Count's Hedge; French, *La Haye*), practically, though not formally, the capital of the Netherlands, in the province of South Holland, 33 mi. s. w. from Amsterdam, and within 3 mi. of the sea. It is the residence of the king and of the foreign ambassadors, and the seat of the states general of the Netherlands. There are some manufactures—iron, ordnance, gold and silver wares, hats, furniture, etc. Pop. 199,285.

Hague Peace Treaty.—For an account of the Peace Conference held at The Hague in 1899, and the treaty formulated see *Peace Congress at The Hague.*

Hahnemann (hä'nė-mån), SAMUEL CHRISTIAN FRIEDRICH (1755–1843), the founder of the homœopathic system, born at Meissen, studied medicine at Leipsic, Vienna, and Erlangen, taking his degree at the last-mentioned place in 1779. After practising in various places, he published in 1810 his *Organon der rationellen Heilkunde,* which fully explained his new system of curing any disorder by employing a medicine which produces a similar disorder. Hahnemann was driven from Saxony by the government prohibiting him from dispensing medicines, but found an asylum ulti-

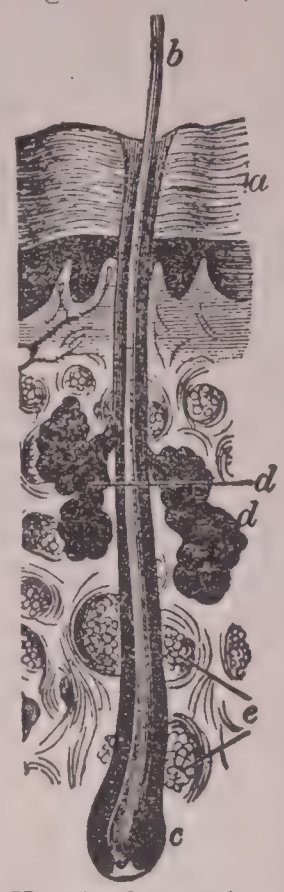
mately in Paris, where his system was authorized by the government and acquired a certain popularity. Among his works notice is due to his *Dictionary of Materia Medica*, his *Essays on Poisoning by Arsenic*, and on the *Effects of Coffee*, and his treatise on *Chronic Affections*.

Hail, small masses of ice or frozen rain falling from the clouds in showers or storms, varying in their form, being either angular, pyramidal, or stellated, as well as in their consistency, being sometimes as hard as ice and sometimes as soft as snow. At the center there is generally an opaque spongy mass, resembling sleet in its composition, and round this a semitransparent congealed mass, consisting of a succession of layers or strata, is formed. Properly there are two kinds of hail —the small grains which generally fall in winter and usually before snow, and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates. The small-grained hail is probably formed by the freezing of raindrops as they pass in falling through colder air than that from which they started. The large or common hail is probably due to the meeting of two currents of air, of very unequal temperature and electric tension. The usual size of hailstones is about ½ in. in diameter, but they are frequently of much larger dimensions, sometimes even 3 or 4 in. in diameter. In hot climates they are very destructive to crops.

Hainan, an island of China, belonging to the province of Quang-Tung, between the China Sea and the Gulf of Tonquin, and separated from the mainland by a channel of 15 miles, encumbered with shoals and coral reefs. It has an area of over 16,000 sq. mi. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of 1,500,000, who cultivate rice, sugar, tobacco, etc. The fisheries are also productive. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. The capital is Kiang-chow, on the northern coast, a large seaport.

Hair, the fine, thread-like, more or less elastic substance, of various form and color, which constitutes the covering of the skin in the class of mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of mammalia is without hair in an adult state. In quadrupeds it is of the most various conformation, from the finest wool to the quills of a porcupine, or the bristles of the hog. The human body is naturally covered with long hair only on a few parts; yet the parts which we should generally describe as destitute of it produces a fine, short, colorless, sometimes hardly perceptible hair. The only places entirely free from it are the palms of the hands and the soles of the feet; but the body of the male often produces hair like that of the head on the breast, shoulders, arms, etc. Each hair consists of a shaft and a root. The shaft or part outside the skin does not grow; but the root imbedded in the skin expands at its lower end into a swelling or bulb, which

is composed of little cells, and grows by forming new cells, the old ones being pressed forward and becoming part of the shaft. The color is due to minute pigment granules in the cells of the hair. The color of the hair is a race character; and the shape of the shaft has likewise been used in this way, transverse sections showing circular, oval, flat, or reniform outlines. The human hair varies according to age, sex, country, and circumstances. At birth an infant generally has light hair. It always grows darker and stiffer with age. The same is the case with the eyelashes and eyebrows. At the age of puberty the hair grows in the armpits, etc., of both sexes, and on the chin of the male. The hair of men is stronger and stiffer; that of females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance, serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. If the root is destroyed there is no means of reproducing the hair; but if it falls out without the root being destroyed, as is often the case after nervous fevers, the hair grows out again of itself. Each hair, indeed, lasts only a certain time, after which it falls out and is replaced by another as long as the papilla are not weakened. Grayness of hair is caused by a deficient amount of pigment granules in the hair cells. The deficiency arises at the hair bulb, where the cells are produced. Any influences that affect the nutrition of the bulb may thus affect the color as well as the growth of the hair. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. Under ordinary circumstances, hair is a very stable substance. It is the last thing which decays, and it often grows after death and lasts for centuries. Hair is not acted on by water, but heated in it under pressure it decomposes, evolves sulphureted hydrogen, and dissolves; it is also dissolved by alkalies and acids. When burned it emits a disagreeable odor as of burning horn.



Vertical section of skin, showing hair folicle; *a.*—epidermis; *b.*—hair; *c.*—hair-bulb; *d, d.*—oil-glands; *e.*—fat cells.

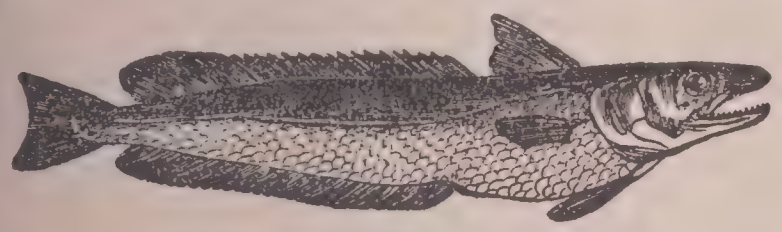
Hair for manufacture is furnished chiefly from the horse, the ox, the hog, the goat, especially the Angora or Mohair goat, the camel, and the alpaca. That of the first three is most used for upholstery purposes, the short hair being manufactured into curled hair for stuffing, and the long, straight hair manufactured into haircloth for seating. The long hair is also reserved for the manufacture of fishing lines, brushes, etc. White hair is of the most value, being most adapted for dyeing

and for the manufacture of fancy articles. The horse hair used for weaving comes chiefly from Russia, Germany, Belgium, South America, and Australia. Russia chiefly furnishes the bristles, so largely used for brushes. The sable, the minniver, the martin, the badger supply the finer brushes or hair pencils of painters. The hair of the goat, the camel, and the alpaca is chiefly used in combination with or subordinated to wool and other fibers for spinning and weaving into dress fabrics. Human hair is used chiefly for the manufacture of wigs, curls, beards, chignons, etc. Most of the supply comes from France, Germany, and Italy, where the peasant girls sell their hair to itinerant dealers. In every case, and for any purpose, hair is always best taken from the living subject; dead hair being much inferior.

Hair Dyes, substances for giving hair some particular color desired. The numerous preparations sold for this purpose have generally a basis of lead or nitrate of silver. Bismuth, pyrogallic acid, sulphur, the juice of green walnut shells, and other astringent vegetable juices, are also employed.

Hair Spring, in watches, the fine, hair-like spring made of steel, which is attached to the axle of the balance wheel, and serves by its resisting power to equalize the vibrations of the escapement wheel.

Hake, fishes belonging to that division of the cod family which has the head much flattened, and two dorsal and one long anal fin.



Hake.

The European hake is known in some places as king of the herrings, on which it preys.

Hakoda′di, a city of Japan, near the south end of the island of Yesso, at the foot of a hill on the shore of a beautiful and spacious bay which forms one of the best harbors in the world. Hakodadi is one of the ports opened to British commerce through Lord Elgin's treaty with the Japanese government in 1858. Pop. 37,190.

Halberd (or Halbert), an offensive weapon, consisting of a pole or shaft about 6 ft. long, having its head armed with a steel point edged on both sides. Near the head was a cross piece of steel somewhat in the form of an ax, with a spike or hook at the back. It was much used in the English army in the sixteenth century, and gave its name to troops called *halberdiers*, to whom was confided the defense of the colors, and other special duties. It is now used only on ceremonial occasions.

Halberstadt (hål′bĕr-stät), a town of Prussia, in the province of Saxony, 32 mi. s. w. of Magdeburg, on the right bank of the Holzemme. It is an old town, with many timber-framed and curiously ornamented houses. It has considerable manufactures of carpets, soap, leather, oil, gloves, etc. Pop. 34,025.

Hal′cyon, an old or poetical name of the kingfisher. It was fabled to lay its eggs in nests that floated on the sea, about the winter solstice, and to have the power of charming the winds and waves during the period of incubation, so that the weather was then calm, whence the term, *halcyon days.*

Hale, Edward Everett, D. D., Unitarian clergyman, philanthropist, and author; b. at Boston, Mass., April 3, 1822; son of Nathan Hale, journalist. His early education was received at the Boston Latin School. He graduated from Harvard University in 1839. He settled as pastor of a Unitarian church at Worcester, Mass., 1846. In 1856 he returned to Boston and took charge of the south Unitarian church. Mr. Hale is interested in all movements tending to the elevation of the human race, and the influence of his writings has been wholesome and helpful. In 1869 he founded *The Old and the New*, a monthly publication which he edited until it was merged into *Scribner's Monthly*, 1875. As editor of the *Christian Examiner*, a Unitarian weekly, he was a power among the members of his own denomination. He is a brilliant lecturer as well as an able writer. He has been called "The American Defoe" because he gives to his romances an appearance of fact. This style is well illustrated in *A Man Without a Country*, which was widely read during the Civil War. Among his numerous writings is a series of *Family Flights*, written conjointly with Miss Hale, his niece. He was editor of the Boston edition of Lingard's *History of England.*

Hale, John P. (1806–1873), statesman and Free-soil candidate for the presidency, was b. in New Hampshire. Elected to Congress in 1842, he became prominent in his opposition to slavery. In 1846 Mr. Hale was chosen U. S. senator. In 1847 he was nominated for the presidency by the National Liberty party, and in 1852 by the Free-soil party. His speeches were replete with humor and pathos. His sixteen years in the Senate were devoted to the agitation of the slavery question.

Hale, Nathan (1755–1776), soldier and hero, b. in Coventry, Conn. In 1773 he graduated at Yale and taught school in East Haddam and New London, Conn. He enlisted as a volunteer in the Revolutionary War and became a lieutenant in Colonel Webb's regiment. On Washington's call for a volunteer to enter the British line and procure intelligence, he responded. Disguised as a schoolmaster, he visited all the enemy's camps in New York and Long Island. He obtained the information required and was about to return when he was arrested as a spy, tried, and condemned to be hanged. The execution took place in New York City. His last words were, "I only regret that I have but one life to lose for my country."

Halévy (å-lā-vē), Jacques François Fromental Elie (1799–1862), a French musical composer, b. of Jewish parentage at Paris. His *chef d'œuvre, La Juive,* appeared in 1835, and rapidly obtained a European celebrity.

Halftone

Among his other works are, *L' Eclaire, Guido et Ginevra, La Reine de Chypre, Le Val d' Andorre. La Fée aux Roses.* His son, LUDOVIC HALEVY, b. in 1834, is a popular author of vaudevilles, and has written the librettos of most of Offenbach's operas.

Halftone, a process for making printing plates in relief for use on the typographic press. These plates have a surface broken into numerous fine square or round dots. These dots are small and separated from each other by wider spaces in the high lights of the picture, are larger and tend to merge into each other in the middle tones, and run together into solid surfaces in the deepest shadows, only broken by very small white points, or even quite devoid of them and in places yielding solid blacks when printed. When viewed at ordinary distances the print from such a plate appears to pass by insensible gradations from white into black, the same as a photograph or photogravure, but closer examination shows the fine texture of dots, usually square, running all over the plate. The method of making these plates is simple in theory but complicated in practice, and involves the use of many of the most recent discoveries of science. The subject or copy may be not only a picture made by any known painting or drawing process, but a photograph or any object capable of being photographed conveniently. The process of negative making is usually the "wet" or collodion method of the early days of photography, as negatives made in this way are more plastic, easier modified, intensified, or reduced than by any other known method. Sometimes, however, bromo-gelatine or collodio-chloride of silver dry plates are used for special reasons. The unvarying essential to the process is the presence in the camera of a grating or "screen" made by ruling very fine lines upon a plate of glass. In practice two plates are ruled with these lines diagonally from corner to corner, and are then cemented to each other with the two sets of ruled lines crossing at right angles. The number of lines to the inch is determined by the fineness of engraving desired. The range of screens is from 75 to 200 lines to the inch. This screen is placed in the camera quite close in front of the sensitive plate, so that the image thrown thereon by the lens passes through the openings of the crossed lines. Each of these microscopic openings acts as a separate lens projecting upon the sensitive plate its separate image of the stop opening in the large lens in front. The effect of diffraction causes those openings opposite the most brilliant parts of the image to cast larger as well as more brilliant micro-images or dots upon the plate, while the lesser amount of light passing through the openings opposite the dark parts of the picture produces correspondingly smaller and weaker dots, or even has no perceptible effect. Consequently when the negative is developed it is found to consist of a great number of small dots of sizes graduated in proportion to the light and shade of the picture. The process of reversing the negative previous to printing upon metal is the same as in zinc etching. The negative is, when dry, coated first with a solution of rubber to make it insoluble in the succeeding treatment and when this is set is again coated with a thick pellicle of plain collodion to give it body and strength. It is then, when dry, cut around the edges and laid in a tray of acidulated water. After a few moments the film loosens from the glass and by cautious handling is peeled from its support and laid face downward upon another plate of glass. It is thus reversed to bring the print upon metal in the proper position to give direct impression when printed. If this were not done the picture would face the wrong way when completed. In some cases a reversed negative is made in the first instance by using a reflecting prism or a mirror in front of or behind the lens. The metal used for halftone plates is usually copper, but zinc and brass are sometimes employed. It is finely polished, placed upon a whirling machine and coated with a solution of fish glue, albumen, water, and bichromate of ammonia, and dried by gentle heat. It is then locked down upon the negative in a strong printing frame and printed from five to twenty-five minutes by electric light. The development varies with different operators but consists essentially in soaking in running water until the soluble parts of the coating are washed away, leaving a faintly visible image formed of dots of insoluble glue upon the plate. This is burned in over a gas furnace until the metal passes into a silvery hue and the image shows brilliantly in a clear, deep maroon color. The etching is rapidly done by the use of various acid solutions, the one most used being the acid perchloride of iron. When fully etched the plate is proofed and if satisfactory given to the finisher to receive any needed hand engraving or corrections, after which the edges are beveled upon a beveling machine, it is nailed upon a block of wood, the edges of the block trimmed square, the back shaved off to type height, and it is then ready for the press. The most recent and most rapid of modern engraving methods, it is also one requiring the highest skill and technical as well as artistic knowledge to produce satisfactory results.

In its origin the process is an indirect result of the labors of Nicephore Niepce in 1814, and of a long list of succeeding experimenters. The first known application of the principle of breaking up the smooth gradations of tone in a photograph or similar original into graduated dots or lines for a printing surface was that of Baron F. W. von Egloffstein, who commenced work in 1860 or earlier. In 1861 with the aid of Samuel Sartain, a noted steel engraver, of Philadelphia, he produced the first perfect ruled glass screen known to have been made for this purpose, and also finished several steel-plate engravings from it. As he applied the process to the production of plates etched with intaglio or sunken lines, on steel, to be printed on the

copperplate press, and intended to use it for the purpose of bank-note engraving as well as making fine map plates, his screens were ruled with from 220 to 300 or even more lines to the inch. In 1863 he successfully produced a fine map plate for the United States government by this process. He patented the process in 1865. After his death the process fell into disuse and oblivion. In 18[illegible] Meissenbach, of Germany, fell upon the idea of using the screen in the camera and began to make halftone relief plates similar to those now used, and in 1881 the process became a commercial success in Europe. About 1881 Mr. F. E. Ives, of Philadelphia, invented a process of his own totally different in procedure, but superior in results to that of Meissenbach. In like manner and about the same time John C. Moss, of New York, independently invented still another form of procedure giving excellent results and bearing the name of Mosstype. In time the process was simplified to its present form, which is, with minor variations, worked in every civilized country. In 1890 Max Levy, of Philadelphia, perfected devices for ruling glass screens with a diamond point and etched them, filling the etched lines with a black pigment previous to sealing the glass plates together, and placed them on sale as a commercial product. To this fact is due the rapid growth of the industry since that time. The product is also called phototype. Its most recent application is to the production of plates for three-color printing, called colortype or photochromotype work. For this purpose three negatives are made by the use of color-screens or ray filters attached to the lens, one for red, one for blue, and one for yellow, the screens being tinged with the complementaries of these colors, green, orange-red, and violet respectively. The plates etched from these negatives, when printed successively in the colors named, yield in the composite impression hues closely resembling those of the original subject.

ROGER CUNNINGHAM.

Hal'ibut (or Hol'ibut), one of the largest of flatfish family, sometimes weighing more than 300 lbs. The fish has a compressed body, one side resembling the back and another the belly, and both eyes on the same side of the head. It is caught on both sides of the Atlantic, and is much prized for the table.

Hal'ifax, a municipal borough of England, in the county of York (West Riding), on the Hebble, 36 mi. w.s.w. York. It is one of the centers of the woolen and worsted manufactures in Yorkshire, a great variety of goods being produced. There are also iron, chemical, and machine making works. Pop. 82,864.

Halifax, a city, and the capital of Nova Scotia, situated on the slope of a commanding hill, on the western side of Halifax harbor. The harbor is one of the best in America. It is the principal naval station of British America, has an extensive foreign and coasting trade, and exports large quantities of fish, lumber, and coals. There are also considerable manufactures embracing iron castings,

machinery, nails, soap, leather, tobacco, paper, etc. Pop. 38,556.

Hall, CHARLES FRANCIS (1821–1871), an Arctic explorer, b. at Rochester, N. H. He began life as a blacksmith, became a journalist in Cincinnati; in 1860 organized an Arctic expedition in search of Franklin, and remained among the Eskimos for two years, acquiring their language and habits. In 1864 he undertook a second expedition to the same regions, where he remained until 1869. In 1871, at the instigation of Hall, the U. S. government fitted out the *Polaris* for an expedition to the North Pole, and placed Captain Hall in command. The *Polaris* sailed from New York June 29, 1871, and on August 30 reached lat. 82° 16′ n., and then turned back to winter in a sheltered bay, lat. 81° 38′, where Hall died on November 8. The *Polaris* was ultimately abandoned by her crew, who reached home only after experiencing many privations and adventures. An account of his first expedition was given by Captain Hall in his *Arctic Researches and Life Amongst the Eskimos.*

Hallam, HENRY, English historian (1777–1859), a son of the dean of Bristol, b. at Windsor. He was educated at Eton and Oxford, and studied for the law, but abandoned it for literary pursuits. His contributions to the Edinburgh *Review* brought him into notice, and his *View of the State of Europe during the Middle Ages*, which appeared in 1818, at once established his reputation. His next work, the *Constitutional History of England*, published in 1827, showed like the first the solid learning, patient research, accuracy, and impartiality of statement, which are characteristic of Mr. Hallam's work. In 1837–39 appeared his last great work, the *Introduction to the Literature of Europe*, a useful survey of literary history, though wanting in the fineness of judgment necessary for such work. His youngest son, ARTHUR HENRY, a youth of high promise, suddenly cut off at the age of twenty-two, is the subject of Tennyson's poem, *In Memoriam.*

Halle (hăl'lĕ), usually called Halle an der Saale (Halle on the Saale), to distinguish it from other places of the same name, an important German town in the Prussian province of Saxony, about 20 mi. n.w. of Leipsic, on the river Saale. The university, with which that of Wittenberg was incorporated in 1817, is a celebrated institution founded in 1694, and attended by 1,500 students. Halle has extensive trade and manufactures, chiefly chemicals, oil, malt, dyes, agricultural machines, etc., besides its salt works. Pop. 101,401.

Halleck, FITZ GREENE (1790–1867), an American poet. He became a clerk in a New York banking house, and for years was in the employment of John Jacob Astor. In 1819 poems by him and a friend (J. R. Drake) appeared in the New York *Evening Post* under the signature of Croaker & Co., and attracted some attention. In 1820 he published *Fanny*, his longest poem, a satire on the follies and fashions of the day. In 1822 he visited Europe. Among his best poems are, *Marco Bozzaris*, *To*

the Memory of Burns, *Alnwick Castle*, and *Red Jacket*.

Halleck, HENRY WAGER (1815–1872), general, b. at Utica, near New York, was educated for the army at West Point, and entered the engineers in 1839. In 1846 he published *Elements of Military Art and Science*, and he was raised to the rank of captain for his services in the Mexican War. In 1854 he left the army and settled in San Francisco as a lawyer and director of a mining company. On the outbreak of the Civil War, in 1861, he was created major general in the United States army. After the victories at Paducah, Fort Henry, Fort Donelson, and the capture of Corinth, he became, in 1862, commander-in-chief, till superseded by General Grant in 1864. Ultimately he received the command of the South Division at Louisville, where he died. Among his writings are two works on International Law.

Halleluia (or Hallelujah, or Alleluia) (praise ye the Lord), a Hebrew formula of praise often occurring in the Psalms, and which is retained in the translations of the various Christian churches, probably on account of its full and fine sound, so proper for public religious services. The *Great Halleluja* is the name given by the Jews to Psalms 113–117 which are sung on the feasts of the Passover and Tabernacles.

Halliwell-Phillipps, JAMES ORCHARD (1820–1889) (originally J. O. Halliwell), Shakespearean scholar. In 1839 he began his editorial labors with a reprint of Mandeville's *Travels*. His chief Shakespearean publications are a *Life of Shakespeare* (1848), the *Works of Shakespeare* in 16 folio volumes, only 150 copies printed; *Calendar of the Records of Stratford-on-Avon; History of New Place;* and *Outlines of the Life of Shakespeare*. He issued also 47 volumes of lithographed facsimiles of the quarto plays, and a great number of pamphlets on Shakespeare, Stratford, and kindred topics. He also published a valuable *Dictionary of Achaic and Provincial Words*.

Hallow-even (or Hallowe'en), the evening of October 31, so called as being the eve or vigil of All Hallows, or All Saints, which falls on November 1. It is associated in the popular imagination with the prevalence of supernatural influences, and in Scotland is frequently celebrated by meetings of young people, with the performances of various mystical ceremonies humorously described by Burns in his poem *Hallowe'en*.

Hallucinations, according to Esquirol, are morbid conditions of mind in which the patient is conscious of a perception without any impression having been made on the external organs of sense. Hallucinations are to be distinguished from delusions, for in these there are real sensations, though they are erroneously interpreted. Pinel was the first who connected hallucinations with a disturbance of the phenomena of sensation, and the investigation has been pursued further by Esquirol, Maury, Brière de Boismont, and others. All the senses are not equally subject to hallucinations; the most frequent are those of hearing; next, according to many, come those of sight, smell, touch, and taste; and hallucinations of several senses may exist simultaneously in the same individual, and also be complicated with certain delusions. The simplest form of hallucinations of hearing is the tingling of the ears; but the striking of clocks, the sounds of musical instruments and of the human voice are often heard, and in these instances, as in those of the perturbations of the other senses, there must be a diseased sensorium, though there should be no structural derangement of the nerves. Hallucinations are not confined to those whose mental faculties have been alienated, but occasionally assail and torment even the sane. Occasionally hallucinations supervene where the system is healthy, and the individual fully conscious of the unreality of the objects that address his senses, and this disorder is often associated with much ability and wisdom in the conduct of life. Among well-known and authenticated hallucinations are that of the second Earl Grey, who was haunted by a gory head, which, however, he could dismiss at will, and that of Bernadotte, king of Sweden, who was beset in his rides by a woman in a red cloak, although perfectly conscious of the hallucination under which he labored.

Ha'lo, the name given to colored circles of light sometimes seen round the sun or moon, and to other connected luminous appearances. These phenomena are classified as: 1, *halos proper*, consisting of complicated arrangements of arcs and circles of light surrounding the sun or moon, accompanied by others tangent to or intersecting them; 2, *coronas*, simple rings, generally somewhat colored; 3, *aureolas*, the name given to the kind of halo surrounding a shadow projected upon a cloud or fog-bank, or to the colored rings observed by æronauts on the upper surface of clouds. All these appearances are the result of certain modifications which light undergoes by reflection, refraction, dispersion, diffraction, and interference when it falls upon the crystals of ice, the raindrops, or the minute particles that constitute clouds.

Halstead, MURAT (1829–), journalist, was b. in Butler co., O. Beginning as local reporter on the Cincinnati *Commercial* in 1853, in 1867 its control passed into his hands. After pursuing for a time a course of independent journalism, he allied himself with the Republican party. In 1883 the *Commercial* and *Gazette* were consolidated. Mr. Halstead has exercised a notable control in the councils of his party.

Ham, one of the three sons of Noah. He had four sons—Cush, Mizraim, Phut, and Canaan—from the first three of whom sprang the tribes that peopled the African continent, as Canaan became the father of the tribes that principally occupied the territory of Phœnicia and Palestine.

Ham, the inner angle of the joint which unites the thigh and the leg of an animal, but more generally understood to mean the cured

and smoked thigh of the ox, sheep, or hog, especially the last. Usually the meat is first well-rubbed with salt, and a few days after it is rubbed again with a mixture of salt, saltpeter, and sugar, though sometimes the saltpeter is omitted. After lying for eight or ten days it is ready for drying. The smoking of hams consists in subjecting them to the smoke of a fire, wood being used in preference to coal in the process of smoking.

Ham′adryad, in Greek mythology, a kind of wood nymph conceived to inhabit each a particular tree, with which they were born and with which they perished.

Hamburg, one of the free cities of Germany, a member of the Germanic Empire, and the greatest commercial port on the continent of Europe, situated about 80 mi. from the North Sea, on the north branch of the Elbe, which is navigable for large vessels. The town of Altona adjoins it on the west. From the Elbe proceed canals which intersect the eastern and lower part of the city in all directions, and it is also intersected by the Alster, which here forms two fine streets, the Binnenalster and Aussenalster. The quays and harbor accommodation are very extensive. Hamburg is of most importance on account of its great shipping trade, and the business of banking, exchange, marine assurance, etc., carried on in connection with that. Its manufactures, though large, are less important, including shipbuilding, tobacco and cigar making, iron founding, brewing, etc. A great many emigrants embark here. The state of Hamburg embraces a territory of 158 sq. mi., and consists of three divisions, viz., City of Hamburg, with a pop. of 323,928; fifteen rural districts, pop. 245,337; outlying towns and bailiwicks (Cuxhaven, Ritzebüttel, etc.), pop. 47,193. The legislative power belongs in common to the senate and the house of burgesses, but the executive power is vested chiefly in the senate, which is composed of eighteen members, of whom nine must have studied law or finance, and of the other nine seven must belong to the commercial class. The members are elected for life. The house of burgesses consists of 160 members, half of whom are elected every three years by the votes of all tax-paying citizens, while the other half are chosen partly by a much-restricted franchise, and partly deputed by guilds and corporations.

Ham′eln, a town of Germany, in Hanover, on the Weser, which is here crossed by a suspension bridge. It has many picturesque old buildings and remains. Hameln is famous as the scene of the legend of the Pied Piper of Hameln made famous by a poem of Robert Browning. Pop. 11,830.

Hamil′car, the name of several Carthaginian generals, of whom the most celebrated was Hamilcar, surnamed Baraca (the lightning), the father of the great Hannibal. While quite a young man he was appointed to the command of the Carthaginian forces in Sicily, in the eighteenth year of the first Punic War, B.C. 247, when the Romans were masters of almost the whole island. For two years he

defied all the efforts of the Romans to dislodge him; but the Carthaginian admiral, Hanno, having been totally defeated off the Ægates, B. C. 241, he reluctantly consented to evacuate Sicily. A revolt of the returned troops, joined by the native Africans, was successfully repressed by Hamilcar. He then entered on a series of campaigns in Spain, where he founded a new empire for Carthage. Here he passed nine years, and had brought the whole southern and eastern part of the country under Carthaginian rule when he was slain in battle against the Vettones, B.C. 229. His great design of making Spain a point of attack against Rome was ably carried out by his son Hannibal.

Ham′ilton, a burgh of Scotland, in Lanarkshire, on the Clyde, about 10 mi. s. e. of Glasgow. Coal, ironstone, and limestone are extensively worked in the vicinity. Pop. 24,863.

Hamilton, the capital of the Bermudas, on the coast of the largest island, near the middle of the group. It has a landlocked harbor. Pop. 2,000.

Hamilton, Wentworth co., province of Ontario, on Burlington Bay and Lake Ontario, 40 mi. s.w. of Toronto. Railroads: Grand Trunk; Toronto, Hamilton, & Buffalo; Canadian Pacific; Hamilton & Dundas; and Hamilton Radial Electric Ry. Industries: cotton mills, five flouring mills, iron foundry, stone foundries, wire works, screen works, canning factories, and rolling mills. Surrounding country agricultural. A few mi. e. is the battlefield of Stoney Creek, and on the w. of the city is Burlington Heights, both famous in the War of 1812. Pop. est. 1897, 52,000.

Hamilton, Butler co., O., on Miami River, and Miami and Erie Canal, 20 mi. n. of Cincinnati. Railroads: C. H. & D.; C. & D.; P. C. & St. L. The principal industries include large agricultural implement works, paper mills, steam pump and bending factories, manufacture of railroad supplies, boots and shoes, saws, rope, candles, brooms, sash and blinds, woolen and flouring mills, breweries, distilleries, etc. Pop. 1900. 23,914.

Hamilton, ALEXANDER (1757–1804), a distinguished officer and legislator during the war for independence, was b. in the island of Nevis, West Indies. At the age of sixteen he became a student of Columbia College, New York. On the outbreak of the war he received (1776) a commission as captain of artillery, and soon attracted the attention of Washington, who appointed him his aide-de-camp, and employed him in the most delicate and difficult affairs. In 1781 he left the service, studied law, became a delegate from the state of New York in 1782, and in 1787 was one of the delegates who revised the Articles of Confederation. He was a strong supporter of the federal party, and by the letters which he wrote to the *Daily Advertiser* of New York, afterward published under the title of *The Federalist*, contributed greatly to the success of the party. On the organization of the federal government in 1789, with Washington at its head, Hamilton was appointed secretary of the treasury. This

office he held till 1795, when he resigned and retired into private life. In 1798 he was appointed second in command of the provisional army raised under the apprehension of a French invasion, and on the death of Washington, in 1799, he became commander-in-chief. In 1804 he became involved in a political dispute with Aaron Burr, then candidate for the governorship of New York, accepted a challenge from that gentleman, and was shot by him.

Hamilton, Sir William (1788–1856), a metaphysician, the most acute logician, and most learned philosopher of the Scottish school. Having studied with distinction at Glasgow, in 1809 he entered Baliol College, Oxford, as a Snell exhibitioner, where he gained first-class honors. In 1813 he was admitted to the Scottish bar. In 1820 he became a candidate for the chair of moral philosophy in Edinburgh. In 1829 the publication in the Edinburgh *Review* of his celebrated critique of Cousin's system of philosophy gave him at once a first place among the philosophical writers of the time. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. In 1846 he published an annotated edition of the works of Thomas Reid, and in 1854 the first volume of a similar edition of the works of Dugald Stewart.

Hamites (descendants of Ham), the name given to a number of races in North Africa, who are regarded as of kindred origin and speak allied tongues. They include the ancient Egyptians and their modern descendants, the Copts, the Berbers, Tuaregs, Kabyles, the Gallas, Falashas, Somali, Dankal ,etc.

Hamlet, Prince of Denmark, the hero of Shakespeare's famous tragedy. The story is founded on an old tradition, related, among others, by Saxo-Grammaticus, of a Danish prince, Hamlet, who lived about 500 B.C., but essentially altered in details and conclusion.

Hamlin, Hannibal (1809–1891), vice president of the U. S., was b. in Maine. He learned printing, practised law, and served as a member of the legislature. In 1842 he was elected to Congress, and in 1848 U. S. senator. In 1860 he was elected vice president. In 1869 he was chosen U. S. senator, serving until 1881. He was an original antislavery man.

Hammer Beam, a short beam attached to the foot of a principal rafter in a roof, in the place of the tie beam. Hammer beams are used in pairs, and project from the wall, extending less than half way across the apartments. The hammer beam is generally supported by a rib rising up from a corbel below; and in its turn forms the support of another rib, constituting, with that springing from the opposite hammer beam, an arch.

Hammer Oyster, a bivalve shellfish, *Malleus vulgāris,* inhabiting the Indian Archipelago, resembling the pearl oyster when young, but becoming always more hammer-like as it advances in age, by the lengthening of its two ears.

Hammersmith, a suburban district of London, in Middlesex, about 6 mi. w.s.w. of the London postoffice. The Thames is here crossed by a fine suspension bridge. The vicinity is occupied chiefly by nurseries and market gardens. Pop. 97,237.

Hammock, a rectangular piece of cloth or netting, about 6 ft. long and 4 ft. wide, gathered together at the two ends and slung horizontally, forming a sort of bed or place in which one may recline for pleasure. Hammocks are in common use on board ships of war. The word is said to be of Caribbean origin.

Hammond, Lake co., Ind.. on Calumet River, 18 mi. s. of Chicago. Railroads: C. I. & L.; M. C.; C. & E.; Nickel Plate; L. S. & M. S.; B. & O.; P. F. W. & C.; C. & W. I.; Joliet & Eastern; C. H. & W. belt. Industries: steel mills, nail mills, axle works, foundry, and packing company. Surrounding country agricultural. Contains the largest beef killing plant in the world, and three race tracks. The town was first settled in 1869 and became a city fn 1876. Pop. 1900, 12,376.

Hampden, John (1594–1643), celebrated for his patriotic opposition to taxation by prerogative. In 1609 he entered Magdalen College, Oxford. He began the study of law in the Inner Temple, but having inherited an ample fortune on his father's death he lived the usual life of a country gentleman. He entered Parliament in the beginning of Charles I's reign, and continued for three times in succession. Although for some years a uniform opposer of the arbitrary practises in church and state, it was not till 1636 that his resistance to Charles's demand for ship money made him the argument of all tongues. In 1637 he was one of those who meditated emigration to America, which they were prevented from carrying out by an order in council detaining them. Henceforward he took a prominent part in the great contest between the crown and the Parliament, and was one of the five members whom the king, in 1642, so imprudently attempted, in person, to seize in the House of Commons. When the appeal was made to the sword, Hampden accepted the command of a regiment in the parliamentary army under the Earl of Essex, and was fatally wounded on Chalgrove Field.

Hampshire, Hants, or Southamptonshire, a maritime county, including the Isle of Wight, in the south of England; area 1,037,764 acres. Two ranges of chalk hills, the North and South Downs, traverse the county, running in direction nearly e. and w. On the Downs large flocks of sheep known as the "Hampshire Downs" are fed. Hampshire is also famous for its wool, bacon, honey, and timber. The manufactures are unimportant, but the shipping is very extensive. Pop. 690,086.

Hampshire, New. See *New Hampshire.*

Hampton, Wade (1754–1835), b. in South Carolina. He served in the Revolutionary War, and in the United States Congress from 1795 to 1797, and from 1803 to 1805. He also took active part in the War of 1812. Hampton, Wade, grandson of Wade Hampton, b. in South Car-

olina in 1818. He was educated at the University of South Carolina, and later took part in the Civil War on the Confederate side. In 1876 he was elected governor of South Carolina. He was U. S. senator from 1879 to 1891. President Cleveland in 1893 appointed him U. S. railway commissioner.

Hampton, Elizabeth City co., Va., on Chesapeake Bay, at the mouth of James River, 15 mi. n. n. w. of Norfolk. It is a fashionable summer resort with good sea bathing at Old Point Comfort Beach. Railroad, Chesapeake & Ohio. Industries: brick, fish, oil, etc., and a large shipping trade in oysters, crabs, and fish. Pop. 1900, 3,441.

Hamster, a genus of rodent animals belonging to the family of mice, and closely allied to the rats, which they resemble in their dentition. They are distinguished, however, by

Hamster.

their having short, hairy tails, as well as cheek pouches in which they convey grain, peas, etc., to their winter residence. The common hamster is from 10 to 12 in. without the tail, which is not more than 3 in. long. It is common in the north of Europe and Asia.

Hanau (han′ou), a town of Prussia, province Hesse-Nassau, at the confluence of the Kinzig with the Main. Pop. 24,377.

Hancock, John (1737–1793). Revolutionary patriot and president of Congress, b. in Quincy, Mass. In the inception of the revolutionary struggle he was a leading spirit. The attempt to arrest Hancock and Samuel Adams led to the battle of Lexington. Mr. Hancock was a member of the Continental Congress from 1775 to 1780, also from 1785 to 1786, serving as president of the body from 1775 to 1777. The Declaration of Independence as first published bore only his name. He served as governor of Massachusetts twelve years. As an orator he was eloquent; as a presiding officer dignified and impartial.

Hancock, Winfield Scott (1824–1886). His grandfather was of Scottish birth. Winfield graduated at West Point in 1844. He participated in the important battles of the Mexican War. In 1861 he was made brigadier general. At Fredericksburg he led his men through such a fire as has rarely been encountered in warfare. At Gettysburg he was dangerously wounded. In 1866 was appointed major general in the regular army. In 1880 was the Democratic candidate for the presidency of the U. S., but was defeated by James A. Garfield.

Hand, the part of the body which terminates the arm, consisting of the palm and fingers, connected with the arm at the wrist; the prin-

cipal organ of touch and prehension. See *Anatomy*.

Hand-Ball, an old game played by two or four persons with a tennis ball, which they knock with the hands against a wall. Lines are drawn on the wall and on the ground and when the ball goes outside these lines it is supposed to have struck a side wall. The back board is the boundary on the side. The ace line is drawn half way between and parallel to the front wall and back board. The man who begins the game is called the *striker* and stands inside the ace line, while his opponent, the *player*, stands outside of it. The striker bounds the ball on the ground and strikes it with his hand so that it rebounds from the front wall. The ball must rebound outside of the ace line. If it fails to do so three successive times, or if it bounds on a side wall before striking the front wall, or if it bounds outside the back board, it is called a *hand out* and the players change places. If the ball is properly served, it must be struck by the player either before it strikes the ground or after the first bound, so that it strikes the first wall. This is a return. If the player fails to return the ball the striker scores one point, called an ace. If he returns it properly, the striker must bound it again from the front wall, and if he fails to do so they change places. After the ball has been served it may strike the ground anywhere inside the court. When the striker has scored or made a hand out an inning has been played and the players change positions. After the first inning the striker continues to serve after he scores and an inning closes only when there is a hand out. The person who first makes 21 points wins the game.

Handel (properly Haendel), George Frederick (1685–1759), a German composer b. at Halle on the Saale. In 1696 he was sent to Berlin, where he heard the music of Bononcini and Ariosti, then at the head of the Berlin Opera House. He returned to Halle, was appointed organist of the cathedral in 1702, but soon left to visit Hanover and Hamburg, where Steffani and Reinhard Keiser resided. At Hamburg he played second violin in the orchestra, and brought out in 1704 his first work, an oratorio on the Passion, and his first opera, *Almira*, followed in February by his *Nero*. He visited England twice, and ultimately, having received a pension from Queen Anne, settled down there. He was placed at the head of the newly-founded Royal Academy of Music. His last opera was performed in 1740. He produced in succession *Israel in Egypt*, *L'Allegro* and *Il Penseroso*, *Saul*, and *The Messiah*. The last mentioned, which is his chief work, was brought out in 1741, for the benefit of the Foundling Hospital. It was not much appreciated at the first representation, but increased in reputation every year. In 1752 he became blind, but did not lose his spirits, continuing to perform in public and even to compose. He was buried in Westminster Abbey.

Hang Chow (or Hang-Choo), a large city in China, capital of the province of Chekiang, on

the estuary of the Tsien-tang-kiang. It is one of the handsomest cities of China, with many magnificent temples, monuments, and triumphal arches. It has extensive manufactures in silks, furs, gold and silver ornaments, tapestries, lacquered ware, fans, etc., and a large trade. The larger portion of the inhabitants live without the walls in the beautiful suburbs, and in boats on the river. It is also a great center of literary and ecclesiastic life. Pop. est. at 800,000.

Hankow' ("Mouth of the Han"), a town and river port in China, in the province of Hupeh, at the junction of the Han with the Yang-tse-kiang. The port was opened to foreign trade in 1862, and has become the chief emporium for the green tea districts in the central provinces, which formerly sent their produce for export to Canton. Large steamers ascend to the town. Pop. 750,000.

Han'ley, a municipal and parliamentary borough of North Staffordshire, England. It is a modern town, owing its growth entirely to the vast manufactures of china and earthenware in which the inhabitants are mostly employed; but there are also iron furnaces, foundries, brick works, and several important collieries. Pop. 54,846.

Han'nibal (or An'nibal) (B. C. 247–183), one of the greatest generals of antiquity; was the son of Hamilcar Barca, also a general and leader of the popular party among the Carthaginians. He grew up in his father's camp in Spain, but returned to Carthage. At the age of twenty-two he returned to the army in Spain, then commanded by his brother-in-law Hasdrubal, and three years after, on the murder of Hasdrubal, received the chief command by acclamation. Hannibal now prepared to carry out his great designs against Rome. Hannibal, judging that Rome could be overthrown only in Italy, undertook his great march on Rome across the Pyrenees, the Rhone, and the Alps. He set out with 90,000 foot soldiers, 40 elephants, and 12,000 horsemen. When he reached the northern foot of the Alps he had still 50,000 foot soldiers, 9,000 horse, and 37 elephants. When he arrived at the southern foot, after 15 days of incredible toils, his force had diminished to 20,000 foot soldiers and 6,000 horse. The point at which he crossed is generally believed to have been the Little St. Bernard. On the banks of the Ticino he first encountered a Roman army under Publius Scipio, and defeated it mainly by the superiority of his Numidian cavalry, 218 B. C. Hannibal opened the next year's campaign (217) by defeating the Roman general Flaminius. Hannibal now marched into Apulia, spreading terror wherever he approached. Rome, in consternation, proclaimed Fabius Maximus dictator, who sagaciously resolved to hazard no more open battles, but exhaust the strength of the Carthaginians by delay. But for some time the wisdom of this policy was not understood by his countrymen, who, dissatisfied with his inactivity, appointed Minutius Felix his colleague. The result was that the latter was drawn into a battle by Hannibal, and would have perished but for the aid of Fabius. After this the Roman generals avoided engagements, and Hannibal at this critical period saw his army wasting away in inactivity. The next year a battle was fought at Cannæ, the Romans under L. Æmilius Paulus and Varro numbering more than 80,000 men, the Carthaginians about 50,000, and ended in a total defeat of the Romans, 40,000 or 50,000 of whom were slain and the rest scattered. Instead of marching on Rome, Hannibal now sought quarters in Capua, where luxurious living undermined the discipline and health of his troops. The campaigns of 215, 214, and 213 were comparatively unimportant. While Hannibal was seizing Tarentum (212), Capua was invested by two Roman armies. To relieve Capua Hannibal marched on Rome, and actually appeared before its gates (211), but the diversion remained fruitless and Capua fell. Hannibal now retired to Bruttium (the toe of Italy), where he still maintained the contest against overwhelming odds, till, in 203, he was recalled to defend his country, invaded by Scipio. In Africa he was defeated by the Romans at Zama (202 B. C.), and the Second Punic War ended, after a bloody contest of eighteen years, in Carthage having to accept the most humiliating conditions of peace. Hannibal now devoted himself as civil magistrate to restoring the resources of Carthage, and was working at reforms of administration and finance when the jealous Romans sent ambassadors to demand his surrender. He fled to the court of Antiochus of Syria, and offered his services for the war then commencing against the Romans. They were accepted, but Hannibal's advice for the conduct of the war was not followed, and he himself as commander of the Syrian fleet failed in an expedition against the Rhodians. Hannibal, again obliged to flee, took refuge with Prusias, king of Bithynia, and is said to have gained several victories for Prusias, against Eumenes, king of Pergamus, an ally of the Romans. But the Roman senate once more sent to demand the surrender of their inveterate enemy, and Hannibal, finding that Prusias could not protect him, took poison rather than fall into the hands of the Romans.

Hannibal, Marion co., Mo., on Mississippi River, 112 mi. n.w. of St. Louis. Railroads: C. B. & Q.; H. & St. J.; St. L. K. & N. W. Wabash; and others. Industries: railroad machine shops, car works, iron foundry, grain elevators, flouring mills, tobacco factories, limekilns, and has an extensive shipping trade in lumber and other products. Pop. 1900, 12,780.

Hanoi' (or Kesh'o), capital of Tonquin, on the river Song-ka, in a fruitful plain. Gold and silver filagree, lacquered wares, silks, mat and basket weaving are its principal industries.

Han'over (Ger. *Hannover*), formerly a kingdom in the n.w. of Germany, now a province of Prussia. Area 14,857 sq. mi. For administrative purposes it is divided into six districts —Hanover, Hildesheim, Lüneburg, Stade, Osnabrück, Aurich. The Harz Mountains are

rich in minerals, the working of which is an important industry. Pop. 2,278,361.

Hanover, capital of the Prussian province of Hanover. Hanover is a manufacturing town of some importance, has cotton spinning, machine works, iron foundries, chemical works, tobacco and cigar factories, etc. Hanover is first mentioned in 1163. It joined the Hanseatic League in 1481. It became the residence of the dukes of Brunswick-Lüneburg, and capital of the principality in 1636. Pop. 165,499.

Hanover, York co., Pa., 48 mi. from Baltimore. Railroads: Western Maryland and Frederick division P. R. R. Industries: match factory, two flouring mills, two iron foundries, cigar factory, and two factories for the manufacture of agricultural implements. The town was first settled in 1737, and laid out as a town in 1764 by Col. Richard McAllister, became a borough in 1815. Pop. 1900, 5,302.

Hanse Towns, certain German and other commercial cities of Northern Europe associated for the protection of commerce and united by what was called the *Hanseatic League.* In the middle of the thirteenth century the sea and land swarmed with pirates and robbers. In particular the thriving ports of the Baltic and the North Sea were infested, and in 1219 a compact was made between Hamburg, Ditmarsh, and Hadeln to protect the adjacent waters. This was followed in 1241 by an alliance with Hamburg and Lübeck to keep open the road across Holstein, connecting the North Sea with the Baltic. In 1247 this league was joined by Brunswick, and out of this grew the Hansa or league, which at its most flourishing period embraced 85 towns, maritime and inland, from Reval and Narva to Amsterdam and Middleburg, and from Cologne to Breslau and Cracow. Among these the town of Lübeck was recognized as the chief town of the league. Here assembled the deputies of the other Hanse towns to deliberate on the affairs of the confederacy; but the decrees of the diet had no effect unless they received the sanction of the separate towns. The chief trading centers of the league were the factories of Novgorod in Russia, Bergen in Norway, Bruges, and London (the so-called steelyard). These factories were subject to an almost monastic discipline, which even required their officers to be celibates and live at a common table. During the latter half of the fourteenth century the power of the league was at its height. It had armies and navies, gained victories in war over the kings of Norway and Denmark, and deposed a king of Sweden. It made thorough provision for the security of commerce on the Baltic and North seas, constructed canals, introduced a uniform system of weights and measures, and developed the principles of mercantile law. But as its power and ambition increased it was felt to be an oppressive monopoly established mainly in the interests of the great seaport towns. It became less needful also for commercial security, as the princes learned the advantages of trade, formed naval forces of their own, and encouraged navigation. Most of the inland members of the confederation withdrew, and, during the fifteenth and sixteenth centuries the cities of Hamburg, Lüneburg, and Lübeck were almost alone in their active efforts to maintain the power of the Hansa and secure for it the command of the Baltic. About the middle of the sixteenth century the Dutch became predominant in the Baltic trade. In 1597 England revoked all special privileges of the Hanseatic merchants, and in 1614 Lübeck, Stettin, Dantzic, Brunswick, Lüneburg, Hamburg, Bremen, and Cologne, with a few smaller towns, were the only places that contributed to the support of the Hansa. The league still made desperate efforts to retain its monopolies, but the cost of doing so now became a heavy tax on the remaining allies. At the last general assembly, held in 1630 at Lübeck, many of the members sent representatives only to renounce their allegiance. The name still remained attached to the free cities of Lübeck, Bremen, and Hamburg, under whose protection the surviving factories continued to exist, that of Bergen being still managed in the old way till 1763. In 1813 Frankfort-on-the-Main was included in the number of the Hanse towns, and in the German confederation these four cities had together one vote in the diet. Frankfort was incorporated in Prussia in 1866, but the other three towns are still separate constituents of the German Empire.

Hapsburg (*Habsburg*, the hawk's castle), a small place in the Swiss Canton of Aargau, on the right bank of the Aar. The castle was built about 1027 by Bishop Werner, of Strassburg. Werner II, who d. in 1096, is said to have been the first to assume the title of Count of Hapsburg. In 1273 Rudolph, son of Albert IV, was chosen emperor of Germany, and from him descended the series of Austrian monarchs, all of the Hapsburg male line down to Charles VI inclusive. After that the dynasty, by the marriage of Maria Theresa to Francis Stephen of Lorraine, became the Hapsburg-Lorraine. Francis II, the third of this line, was the last of the so called "Holy Roman Emperors," this old title being changed by him for that of Emperor of Austria. From the Emperor Rudolph was also descended a Spanish dynasty which began with the Emperor Charles V (Charles I of Spain), and terminated with Charles II in 1700. The castle of Hapsburg is still to be seen on the Wülpelsberg.

Har'akiri (or Sep'puku), a mode of inflicting death upon themselves allowed in Japan to criminals of the Samurai or two-sworded class as more honorable than public execution. It consists in cutting open the body so as to disembowel it by means of a wound made with one sword perpendicularly down the front and another with the other sword horizontally. It is (or was) frequently resorted to to save dishonor or exposure.

Harar, a city of Northeastern Africa, about 150 mi. from the coast of the Gulf of Aden.

It is the center of a small district governed as an independent sovereignty by an emir. The inhabitants are strict Mohammedans. Pop. 30,000.

Harbor, a general name given to any bay, creek, or inlet of the sea, affording accommodation for ships, and protection against the wind and sea. The great requisites of a good harbor are accessibility, adequate depth of water, and shelter from violence of wind and water. Harbors are either natural or artificial, the latter being made wholly or partly by the construction of moles or breakwaters. In connection with the more important harbors, there are usually docks, in which the water is kept as nearly as possible at the same level, thus giving facility in loading and unloading.

Harbor Grace, a seaport of Newfoundland, on the west side of Conception Bay. It is the seat of a Roman Catholic bishop, has a handsome cathedral, and an active trade. Pop. 6,770.

Harburg, a town in Prussia, in the province of Hanover, on the left bank of the South Elbe, opposite to Hamburg. It has varied manufactures and an important trade. Pop. 22,341.

Harcourt, Sir William George Granville Venables Vernon (1827–), lawyer and politician, son of the late Rev. William Vernon Harcourt. He was educated at Trinity College, Cambridge, was called to the bar in 1854, became Queen's Counsel in 1866; contributed frequently to the press, in particular the letters to the *Times* signed "Historicus;" was returned for Oxford City in 1869, in the Liberal interest; distinguished himself by his powers of satire and ridicule in debate; was made solicitor-general in Mr. Gladstone's ministry, November, 1873; home secretary in 1880, when he lost his seat for Oxford, but was returned for Derby. He introduced the Arms bill (Ireland), 1881; Prevention of Crimes bill, 1882; an explosives bill, 1883. In February, 1886, he was made chancellor of the exchequer; and after the resignation of Mr. Gladstone's ministry and the division of the Liberal party, became a prominent leader of the Gladstonian section. He is now the leader of the Liberal party.

Hard Hack, the American popular name of a plant, common in pastures and low grounds, and celebrated for its astringent properties, which causes it to be used medicinally.

Hardicanute (or Harthacnut), king of England and Denmark, was the only legitimate son of Canute. At the time of his father's death, in 1036, he was in Denmark, where he was immediately recognized as king. His half-brother Harold, however, who happened to be in England at the time, laid claim to the throne of that part of their father's dominions and succeeded in getting possession of Mercia, Northumbria, and Wessex, but d. in 1040, when Hardicanute peacefully succeeded him. He reigned till 1042, leaving the government almost entirely in the hands of his mother and the powerful Earl Godwin, while he gave himself up to feasts and carousals.

Hardness, the quality of bodies which enables them to resist abrasion of their surfaces. In mineralogy a scale is used in which a set of standard bodies are arranged and numbered, and other bodies are referred to this scale with respect to hardness. The following is the scale given by F. Mohs: talc 1, rock salt 2, calc spar 3, fluor spar 4, apatite 5, feldspar 6, quartz or rock crystal 7, topaz 8, corundum 9, diamond 10. Materials, according to this arrangement, which are scratched by rock crystal and are not scratched by feldspar are said to have a hardness between 6 and 7.

Hardy, Thomas (1840–), novelist, b. in Dorsetshire, England. He served an apprenticeship as an ecclesiastical architect; published his first novel, *Desperate Remedies*, in 1872, and has since continued a series of favorite fictions. His best-known work is *Far from the Madding Crowd*, with its fine air of rural life. Others are *The Hand of Ethelberta*, *The Trumpet Major*, *The Woodlanders*, *The Return of the Native*, *The Mayor of Casterbridge*, etc.

Hare, the common name of the rodent quadrupeds with long ears, long hind limbs, a short tail, soft hair, and a divided upper lip; the two fore feet have five and the hinder four toes. They run by a kind of leaping pace. The females produce litters of three to six about four times a year. The young leverets have their eyes open at birth. The common hare is found throughout Europe and some parts of Asia. It is tawny red on the back and white on the belly, and is about 2 ft. long. The mountain hare, or varying hare, confined to Northern Europe and the mountainous regions of the south, is smaller than the common hare, and

The Common Hare.

becomes white in winter. *L. cunicŭlus* is the rabbit, properly so called, distinguished by its smaller size and burrowing habits. The American hare, not much larger than a rabbit, is found in most parts of North America. In North America there are also the polar hare, a variety of the varying hare, but of superior size and purer color, and the prairie hare, one of the species known as jackass hares or Jack-rabbits, from their size and length of limb. The hare, which has no courage and little cunning, is protected from its enemies mainly by the acuteness of its sight and hearing and its extraordinary swiftness of foot. Its voice is never heard except when seized or wounded,

when it utters a sharp, loud cry not very unlike that of a child. Its flesh is rather dry, but is much prized for its peculiar flavor.

Harebell, the Scotch Bluebell, a plant common on dry and hilly pastures, by roadsides, etc., in most districts of Europe, with a bell-shaped blue (sometimes white) flower. The radical leaves are cordate or reniform, the stem-leaves partly ovate or lanceolate, partly linear. Its slender stem is from 4 to 6 in. high, and bears sometimes a single flower.

Harebell.

Several American species of *Campanŭla* are known to all lovers of wild flowers.

Ha′rem (Hareem′) (Ar., the prohibited), is used by Mussulmans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number of concubines or female slaves, with black eunuchs, etc. The greatest harem is that of the sultan of Turkey. The women of the imperial harem are all slaves, generally Circassians or Georgians. Their life is spent in bathing, dressing, walking in the gardens, witnessing the voluptuous dances performed by their slaves, etc. The women of other Turks enjoy the society of their friends at the baths or in each other's houses, and appear in public accompanied by slaves and eunuchs; but the women of the sultan's harem have none of these privileges. It is of course only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.

Hargreaves (hăr′grēvz), James (1720–1778), English inventor, author of two important improvements in the art of cotton spinning. In 1760 he invented a machine for carding, and some years after the spinning jenny, by which he was able to spin with several spindles at once. Suspecting that he employed machinery, his neighbors broke into his dwelling and destroyed his machine; and on the repetition of this kind of persecution Hargreaves removed in 1768 to Nottingham. In 1770 he obtained a patent for his invention, but it was after all declared invalid on the ground that he had sold several of the machines before taking out the patent. For the rest of his life he carried on business as a manufacturer.

Harlan, John M., born in Kentucky, 1833.

He was graduated from Center College in 1850 and entered the practise of law three years later. He took part in the Civil War as a Union soldier. In 1877 President Hayes appointed him associate justice of the U. S. supreme court. He was one of the commissioners in the Bering Sea dispute.

Harlequin, a character of the Italian comedy introduced on the stage of other countries. On the Italian stage he is a comic character, full of drolleries, tricks, and knaveries, and somewhat resembles the English clown. The harlequin of British pantomimes is quite different. He is supposed to be the lover of the columbine, and possesses a wonder-working wand, with which he protects his mistress against the clown and pantaloon, who pursue and endeavor to capture her, until the pursuit is brought to a termination by a good fairy. The harlequin wears a tight dress of bright colors, and glittering with spangles.

Harlequin Duck, a species of duck, so called on account of its party-colored plumage of white, gray, and black. It inhabits the Arctic regions. At Hudson's Bay it is called the *Painted Duck;* along the coast of New England, the *Lord.* In length it is about 17 in.

Harley, Robert, earl of Oxford (1661–1724), English minister. After the accession of Anne, he and his colleague, St. John, afterward Lord Bolingbroke, became leaders of the Tories. Harley was chosen speaker of the House of Commons in 1702 under Rochester, and in 1704 was appointed chief secretary of state, but resigned in 1708. After the fall of Marlborough, Harley became chancellor of the exchequer in 1710, and the next year was created Earl of Oxford. He and Bolingbroke secured the Treaty of Utrecht (1713), but afterward quarreled. Early in the reign of George I he was impeached of high treason on the ground of his alleged Jacobite intrigues. He was kept in the Tower for two years, but, owing to the inability of the Peers and Commons to agree about the mode of procedure, he was acquitted. His patronage was extended to Swift, Pope, and other literary men, and he made a valuable collection of books and MSS., which latter are preserved in the British Museum, where they form the *Bibliotheca Harleiana.* Those which have been printed constitute the *Harleian Miscellany.*

Harmon′ica, Franklin's name for a musical instrument constructed with glasses of different sizes, revolving by means of mechanism worked by the foot, and played upon by touching the rim of the glasses with the moistened finger. It constituted the "musical glasses" of Goldsmith's era. The name is now usually applied to an instrument consisting of a series of glass keys played by two small hammers.

Harmon′ics, the accessory sounds accompanying the predominant and apparently simple tone of any string, pipe, or other sonorous body. No purely simple sound, i.e., no sound whose vibrations are all in the same period, is producible in nature. When a sound is produced by the vibration of an open string, the

whole string vibrates as a unity, giving rise to a tone called the fundamental. The string, however, further divides into various sections, which vibrate separately and more rapidly, and produce sounds differing from the fundamental, but bearing certain fixed proportions to it. The first harmonic of the fundamental note of any string is that produced by half the string, and is the octave of the first; the second harmonic is given by the third of the string, and is the fifth or dominant of the fundamental note, and so on, the complete series of harmonics containing all the notes of the musical scale. But while harmonics enter into the composition of any musical sound from any vibrating body whatsoever, the different structure of different instruments suppresses now some, now others, of the succession of harmonics, and a different body of tone is thus produced, distinguishing a note in one instrument from the same note in another.

Harmo'nium, a musical instrument of modern invention, producing sounds somewhat resembling those of the organ, resulting from the pressure of wind on a series of vibrating metallic reeds. By the action of bellows, to which the feet communicate a more or less rapid movement, the air is made to impinge against thin tongues of metal (here termed *reeds*), and to set them vibrating. These metal tongues are fitted into a slit in the top of a small box or sonorous cavity, called a wind box, and are enabled to vibrate by being fixed only at one end. The instrument has a keyboard like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind boxes and act on the vibrator. There are several stops, by means of which the performer can direct the stream of wind into the wind boxes which produce a flute, clarionet, or any other sound. There is also a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once, and what is called the percussion action, which consists in the application of a small hammer, which strikes the vibrator as soon as the key is pressed down, and thus aids the action of the wind. The better class of harmoniums have now usually two or more extra rows of vibrators, which, acted upon by separate stops, add so many octaves to the compass.

Harmony of the Spheres, an hypothesis of Pythagoras and his school, according to which the motions of the heavenly bodies produced a music imperceptible by the ears of mortals. He supposed these motions to conform to certain fixed laws, which could be expressed in numbers corresponding to the numbers which give the harmony of sounds.

Harold (or Harald) I (*Haarfager*, Beautiful-haired), king of Norway, one of the greatest monarchs of that country, succeeded his father in 863. He brought all the Norwegian jarls under his power, and completely subjected the country, allowing his hair to remain uncut for twenty years until he attained this object (885). Of the conquered jarls, Hrolf, or Rollo, emigrated to Neustria (France): others established themselves in Iceland, the Shetland Isles, the Faroes, and the Orkneys. In consequence of their incursions into his dominions, Harold embarked with a naval force to subdue them, and having conquered the Orkneys, etc., returned home. He fixed his residence at Trondhjem, and d. there in 933.

Harold III (*Hardrada*, the Hardy), king of Norway, the son of Sigurd, a descendant of Harold Haarfager. In his youth he went to Constantinople, joined the Varangian Guard, and took part in the expedition to Italy and Sicily against the African pirates. He was ultimately appointed commander of the imperial bodyguard, and defeated the Saracens. About 1042 he returned to Norway, after having, on his way through Russia, married the daughter of the Grand-duke Jaroslav. In 1047 he succeeded his nephew, Magnus the Good, as sole king of Norway. In 1066 he joined Tostig, the brother of Harold II of England, in an invasion of that country, but was defeated and slain at the battle of Stamford Bridge.

Harold I, surnamed *Harefoot*, Danish king of England, succeeded his father Canute in 1035 as king of the provinces n. of the Thames, and became king of all England in 1037. His countrymen, the Danes, maintained him upon the throne against the efforts of Earl Godwin in favor of Hardicanute; and Harold latterly gained the earl over. After a reign of four years Harold d. in 1040.

Haroun al Raschid. See *Harun al Rashid.*

Harp, a stringed instrument of great antiquity, found among the Assyrians, Egyptians, Hebrews, Greeks, Irish, Welsh, and other nations. Its variety of form and construction was only equaled by its universality. The modern instrument is well known; its form is nearly triangular, and the strings distended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. The instrument in its ancient forms was very defective. Egyptian harps are represented with four, seven, ten, twenty, or more strings, but we have little idea of the scale to which they were tuned. The frames are depicted as being curved in various forms, and the front pillars are wanting. The harps of the Hebrews were probably similar to the Egyptian instruments. It is probable that the various Celtic harps were derived from some Oriental pattern. Among the Anglo-Saxons the harp was a favorite instrument. The modern harp was by no means an efficient instrument, until pedals were invented, an invention finally perfected by Sebastian Erard, whose patent was taken out in 1795. In 1810 he patented a double-action harp with seven pedals, each effecting two changes in the pitch of the strings. The harp thus constructed contains forty-three strings tuned according to the diatonic scale, every eighth string being a replicate in another octave of the one counted from.

Harper, William Rainey b. 1856 at New

Concord, O., educated in the Presbyterian College in his native town and then took courses in Yale University, where he received the degree of Ph.D. He taught at various places and was made president of Denison University, Granville, O.; was called from Denison to the chair of Semitic languages in the Baptist Union Theological Seminary. In 1886 he was appointed professor of Semitic language in Yale University, which position he filled until 1891. In 1891 he was chosen president of the new University of Chicago and has the chair of Semitic literature. He has added millions to the endowment of the university, introduced a magnificent system of graduate work and continuous academic terms, and has already made the university one of the leading institutions in the West. Doctor Harper has given much time to the Chautauqua system of general education; has introduced a new method for teaching language and has written many articles concerning Hebrew literature.

Harper's Ferry, Jefferson co., W. Va., at junction of Shenandoah and Potomac rivers, 45 mi. n.w. of Washington. Railroad, Baltimore & Ohio. It is the seat of Stover College for colored youth. Tobacco is raised extensively, and the principal industries are pulp and tobacco factories. Pop. 1900, 896.

Harpies, the ancient Greek goddesses of storms. Their parentage, ages, appearance, names, and number are very differently given by the poets. In the Homeric poems they are merely storm winds. Hesiod represents them as two young virgins of great beauty called Aëllo and Ocypete. The later poets and artists vied with each other in depicting them under the most hideous forms, covered with filth and polluting everything in contact with them. They are often represented as having female faces.

Harp-shell.

Harp-shell, the shell of a genus of molluscs (*Harpa*) belonging to the gasteropoda and to the whelk family. The species are found more especially at the Mauritius. The shells are very beautiful, but exposure to light causes their colors to fade.

Harp'sichord, a keyed, stringed instrument formerly in use, in appearance and construction similar to a grand pianoforte. In the front the keys were disposed, the long ones being the naturals, and the short ones the sharps and flats. These keys being pressed by the fingers, their inclosed extremities raised little, upright, oblong slips of wood, called *jacks*, furnished with crowquill plectrums which struck the wires, instead of the hammers of the modern pianoforte.

Harpy Eagle, a rapacious bird which inhabits tropical America from Southern Mexico

to Southern Brazil. It is an extremely powerful bird, and in total length slightly in excess of the golden eagle. It has, however, a somewhat shorter expanse of wing. Its shoulder muscles possess enormous strength. Its bill is

Harpy Eagle.

powerful and crooked, and its claws are extremely strong and sharp. The harpy eagle feeds on birds, sloths, fawns, raccoons, etc., as well as on fish, water-snakes, and the eggs of the tortoise.

Harris, Wm. T., b. in Conn. in 1835. He was educated at Yale. Among the books which he has published are, *Statement of the System of Education of the U. S.*, and a series of school books. He founded the Philosophical Society of St. Louis, and the *Journal of Speculative Philosophy*.

Harrier, the name of several hawks allied to the buzzards. They strike their prey upon

Hen Harrier.

the ground and generally fly very low. The marsh harrier, the hen harrier, and the ash-colored harrier, are found in Great Britain.

The marsh harrier is from 21 in. to 23 in. long. The hen harrier is 18 in. to 20 in. long. It is very destructive to poultry yards, whence the name. The marsh harrier is found in North America and Cuba.

Harrisburg, Dauphin co., Pa., and capital of the state, on east bank of Susquehanna River, 103 mi. n.w. of Philadelphia. Railroads: the terminus of various branches of the Pennsylvania, Phila. & Reading; and Northern Central. Industries: it is the center of some of the largest iron and steel manufactories in the state, machine works, iron foundries, shoe factories, silk mill, etc. The town was laid out in 1785 by John Harris, whose father located here as an Indian trader in 1705. In 1812 it was made capital of the state and became a city in 1860. Population 1900, 50,167.

Harrison, BENJAMIN, the twenty-third president of the U. S., was born in North Bend, O., in 1833. He is the grandson of William Henry Harrison, ninth president of the United States. In 1852 he graduated from Miami University and went to Cincinnati where he studied law. Two years later he removed to Indianapolis, Ind., where he built up a large law practice. When the war broke out he entered the Union army as lieutenant, but was soon promoted to colonel and organized the Seventeenth Indiana Volunteers. He fought bravely in the Atlanta campaign and at the close of the war returned to the practice of law with the rank of brigadier general. In 1876 he was nominated by the Republican party for governor of Indiana but was defeated at the polls. He was elected U. S. senator in 1881, serving six years. He was nominated for president of the U. S. in 1888 by the Republican National Convention at Chicago. He was elected by a good majority, receiving 233 electoral votes to 168 for Grover Cleveland, the Democratic nominee. Some of the important measures adopted during his presidency were the McKinley Tariff bill, the suspension of the Louisiana Lottery, the establishment of the reciprocity policy, the extension of the navy, the settlement of troubles in Chile and Samoa, and the Bering Sea fisheries arbitration. Mr. Harrison was nominated for a second term in 1892 by the Republicans but was defeated by Cleveland. He returned to Indianapolis, Ind., and resumed the practise of law.Died March 13, 1901.

Harrison, WILLIAM HENRY (1773–1841), ninth president of the U. S., was b. in Charles City co., Va. His father, Benjamin Harrison, was one of the signers of the Declaration of Independence. After his father's death, William joined the army which Wayne was leading against the Northwestern Indians; and showed great gallantry at the battle on the Miami (1794). He represented the Northwest Territory as a delegate in Congress in 1799–1800 and succeeded in passing a valuable law relating to the sale of the federal land in small parcels; and when Indiana Territory was formed (1800), including the present states of Indiana, Illinois, Michigan, and Wisconsin, besides parts of Minnesota and Ohio, he was

appointed its governor. He labored courageously to avert war with the Indians, but was compelled to quell Tecumseh's outbreak, and beat off a fierce and treacherous attack, ending in an important battle at Tippecanoe (Nov. 7, 1811). In the war of 1812–14 he was appointed to the chief command in the Northwest, repulsed the British force under Proctor, and by the victory of Perry on Lake Erie was enabled to pursue the invaders into Canada where, on Oct. 5, 1813, he totally routed them in the battle of the Thames. In 1816 he was elected to Congress, and in 1824 became a U. S. senator. In 1828 he went as ambassador to Colombia, but was recalled in 1829, and for twelve years was clerk of a county court in Ohio. He received 73 electoral votes for the presidency of the U. S. in 1836 against Van Buren's 170; but four years later, the Whig party having united, he defeated Van Buren, obtaining 234 electoral votes to the latter's 60. The contest is noteworthy as having witnessed the introduction of the enormous mass meetings and processions, the emblems and banners, that have since been part of every presidential campaign. Harrison d. a month after his inauguration.

Harrison, Hudson co., N. J.; on Passaic River, opposite Newark. Railroads: Pennsylvania; D. L. & W. Industries: cutlery and machine shops, stone yards, large steel works, thread works, shade roller, and linoleum factories, electric lamp and wire works, and brewery. Pop. 1900, 10,596.

Har'rogate, a town of England, county of York (West Riding), noted for its magnesia, sulphur, and chalybeate springs. The waters are especially recommended for patients with deranged digestive organs, chronic gout, and some cutaneous diseases. The bathing season lasts from May to September, and the number of annual visitors is about 40,000. Pop. 13,917.

Harrow, an agricultural implement, employed for smoothing land which has been plowed. It consists of a frame of woodwork, or of iron, in which are fixed rows of iron teeth. There are several varieties of this implement, such as the "brake," for breaking down rough land; the "drill harrow," for pulverizing between furrows of green crops; the "grubber," for pulverizing land before the deposition of seed.

Harrow-on-the-Hill (or simply Harrow), a town of England, county of Middlesex, on a hill of peculiar form. The grammar school of Harrow, the rival of Eton, was founded in 1571 for the education of the poor children of the parish, certain fees being charged for strangers; but it is now almost entirely a school for the wealthy.

Harte, FRANCIS BRET, American novelist, b. in Albany, N. Y., in 1839. His father dying when he was very young, he went to California with his mother and made a precarious living in mining, printing, and teaching. In 1858 he became editor of a weekly paper, and afterward secretary of the branch mint. In 1868 he was selected as editor of the *Overland Monthly*, and in 1870 was given a literary pro-

fessorship in the University of California. In 1871 he went to New York, and since then has resided in that city and London. His earliest and most successful work was a dialectic story, *The Luck of Roaring Camp*, and since then his more ambitious novels, *Gabriel Conroy*, *Marŋja*, and others, have given him a world-wide reputation. The few poems he has written, such as *Dickens in Camp*, are exquisite in conception and perfect in execution. His humor is quaint and rich, and his works throughout are pervaded with exuberant fancy and in every line exhibit rare artistic skill.

Hartford, Hartford co., Conn., on the Connecticut River, 111 mi. n. e. of New York. The site of Hartford, called by the Indians Suckiang, was settled by emigrants from Massachusetts and first named Newton. Railroads: N. Y. N. H. & H.; N. Y. & N. E.; H. & C. Valley. Its manufactures include firearms, sewing machine, hardware, silver plate, carriages, bicycles, silk goods, machinery, railway equipments, saw and flour mills, marble works, printing, lithographing, and bookbinding establishments. It has also a large leaf tobacco trade. Pop. 1900, 79,850.

Hartlepool, a town of England in the county of Durham, 17 mi. s.e. of the city of that name. The trade and industries of the towns are much of the same character; they possess iron works, puddling furnaces, brass foundries, engine and boiler works, shipyards, sawmills, breweries, etc. Extensive fisheries are also carried on. The two towns may be said to form one port.

Hartshorn, in pharmacy, the horn of the common stag, from which substances deemed of high medical value were formerly prepared by distillation, such as spirits of hartshorn, oil of hartshorn, and salt of hartshorn. The active ingredient of these was ammonia, which is now obtained from gas liquor and other sources.

Harun al Rashid (hȧ-rȯn′ȧl-ra-shēd), a celebrated caliph of the Saracens, 786–809. The popular fame of this caliph is evinced by the *Arabian Nights Entertainments*, in which Harun, his wife Zobeide, his vizier Glaffer, and his chief eunuch Mesrur are conspicuous characters.

Harvard University, the oldest university in the United States, situated in Cambridge, Mass. The nucleus of it was formed in 1636 by the voting of a sum of £400 by the general court of Massachusetts. In 1638 the Rev. John Harvard bequeathed half of his property and his entire library to the projected institution. The college was immediately opened and received the name of its benefactor. The first graduation occurred in 1642. Its endowments have greatly increased since that time, and its invested funds now amount to about $9,000,000. The principal college buildings number twenty-five and include several halls, such as University Hall, Harvard Hall, etc. The general library contains upward of 300,000 volumes. There are upward of 300 professors, exclusive of assistants, and the number of students is about 3,300. An entrance examination is required in one of two

sets of subjects, of which classics predominate in the one, mathematics and science in the other. After the first year's course, which embraces a prescribed series of studies, the student has a large number of different courses to select from in order to qualify for the degree of Bachelor of Arts. The course of study extends to four years. Among the departments connected with the university are: 1, The Law School; 2, the Lawrence Scientific School; 3, the Divinity School; 4, the Medical, and 5, the Dental School, both situated in Boston; 6, the Bussey Institution of Agriculture; 7, the School of Mining. We may also mention the Museum of Comparative Zoology (the Agassiz Museum), the Botanical Garden, and the Peabody Museum of American Archæology and Ethnology.

Harvest Bug, a small larval insect of the family Acaridæ or mites. It is of a bright red color, so small as scarcely to be visible, and resembles a grain of cayenne pepper. It appears in June or July, and attacks the skin of domestic animals, as horses, dogs, sheep, etc., under which it burrows, causing a red pustule to arise. Its attacks are also very annoying to human beings, of whom it attacks the legs, thighs, and lower part of the abdomen.

Harvest Moon, a name which denotes a peculiarity in the apparent motion of the full moon, by which in U. S. and high latitudes generally it rises about the same time in the harvest season (or about the autumnal equinox in September) for several successive evenings. In the southern latitudes this phenomenon occurs in March. It is owing to the fact that the moon is then traveling in that part of her orbit at which it makes the least possible angle with the ecliptic.

Harvey, William (1578–1657), an English physician, the discoverer of the true theory of the circulation of the blood. He entered Caius College, Cambridge, in 1593, and about 1599 proceeded to Padua, then the most celebrated school of medicine in Europe. He took the degree of M. D., and returned to England in 1602. He settled in London, was admitted Fellow of the College of Physicians, elected physician of St. Bartholomew's Hospital, and in 1615 was chosen Lumleian lecturer. His views on the circulation of the blood were formally given to the world in his *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* (*On the Movement of the Heart and Blood in Animals*), published at Amsterdam in 1628, in which he claims to have expounded and demonstrated them for upward of nine years. In 1623 he was appointed physician extraordinary to James I, and in 1632 he became physician in ordinary to Charles I. He was present at the battle of Edgehill, and afterward accompanied Charles to Oxford. Here he received the degree of M. D., and was elected master of Merton College, an office which he lost on the surrender of Oxford to the Parliament. He returned to London in 1646, and spent the remainder of his life in retirement.

Harz (or Hartz) (hȧrts), *Hercynia Silva* of the

Romans, the most northerly mountain chain of Germany, from which an extensive plain stretches to the North Sea and the Baltic. It extends from s.e. to n.w., and comprises an extent of about 60 mi. in length and nearly 20 in breadth, embracing the towns of Klausthal, Goslar, Blankenburg, Wernigerode, etc. The Brocken, its highest summit, is 3,742 ft. high. That part of the Harz which includes the Brocken, with the neighboring high summits, is called the Upper Harz, and consists entirely of granite. The s.e. portion is called the Lower Harz. The Harz abounds in woods and fine pastures; and is rich in minerals, including silver, iron, lead, copper, zinc, arsenic, manganese, granite, porphyry, slate, marble, alabaster, etc.

Has'drubal (more correctly *Asdrubal*, "Baal is his help"), the name of several Carthaginian leaders, particularly the brother of Hannibal, the hero of the Second Punic War. On the departure of Hannibal for Italy, B.C. 218, he was left in command of the army in Spain, in which capacity he carried on a long series of military operations against the Roman troops, which were commanded by Cnæus and Publius Scipio. His brother Hannibal requiring his assistance in Italy, Hasdrubal led an army from Spain into that country (B.C. 207), but before he could join forces with his brother he was defeated on the right bank of the Metaurus by C. Nero and M. Livius. Nero is said to have thrown Hasdrubal's head into Hannibal's camp, by way of announcing the defeat and death of his brother.

Hash'ish, an intoxicating preparation made in Eastern countries from common hemp, or rather from the Indian variety of it; also a name for this plant itself or for its tender shoots. The juice of the plant has powerful narcotic properties, and is variously made use of. A resin which the plant gives out is often gathered and kneaded and formed into small balls called *churrus*, and from this a narcotic is prepared. It has the appearance of a tenacious ointment of a greenish-yellow color, with an acrid savor and a nauseous smell. Hashish produces a kind of intoxication, accompanied with ecstasies and hallucinations.

Hastings, Adams co., Neb. Railroads: Several branches of B. & M.; St. Joe & G. T.; and F. & M. S. Industries: manufacture of paving brick, two iron foundries, flour mill, sash and blind factory. The town was first settled in 1868 and became a city in 1880. Pop. 1900, 7,188.

Hastings (hās'tingz), a market town of England, county of Sussex, one of the Cinque Ports, situated on the seacoast, and including the suburb of St. Leonards-on-Sea. Fishing and boat building are carried on, but the principal support of the town is derived from the numerous visitors who frequent it during the bathing and winter seasons. William of Normandy defeated Harold near here, Oct. 14, 1066. Pop. 60,878.

Hastings, WARREN (1732–1818), first governor general of India, was b. at Daylesford in Worcestershire. He was educated at Westminster School, and in 1750 he set out for Bengal in the capacity of a writer in the service of the East India Company. He was representative of the company at Moorshedabad from 1758 to 1761. In the latter year he removed to Calcutta, having obtained a seat in the Bengal Council, but returned to England in 1764. He again entered the company's service, and sailed for India in 1769. In consequence of the misgovernment of the Nabob of Bengal the company had deprived him of all real power, and now wished to have the country more directly under their control. In 1773 the company's powers were considerably modified by an act of Parliament, and Hastings now received the title of governor general of India. As the majority of the council disapproved of Hastings's past policy, Nuncomar, his old ally, took advantage of the circumstance to accuse him of peculation (1776). The accusations were favorably received by the council, when Nuncomar was suddenly accused by a Calcutta merchant (acting probably on the instigation of Hastings) of forgery, tried, and executed. In 1776 the directors of the company petitioned government for his removal from the council, but Hastings resigned, and a successor to him was appointed. In 1777 he withdrew his resignation, and returned to office. He now displayed extraordinary resource in meeting dangerous movements on the part of the Mahrattas, the Nizam of the Deccan, and Hyder Ali of Mysore, and to procure the needful money was less than scrupulous in his treatment of the rulers of Benares and Oude. He thus gave good grounds for censure, and a motion for his recall was passed in the House of Commons. Fox's India bill was thrown out in 1783, but next year Pitt's bill, establishing the board of control, passed, and Hastings resigned. He left India in 1785, and was impeached by Burke in 1786, being charged with acts of injustice and oppression, with maladministration, receiving of bribes, etc. This celebrated trial, in which Burke, Fox, and Sheridan thundered against him, began in 1788, and terminated in 1795 with his acquittal, but cost him his fortune. The company in 1796 settled on him an annuity of $20,000 a year, and loaned him $250,000 for eighteen years free of interest. He passed the remainder of his life in retirement at Daylesford, which he purchased.

Hat, an outdoor covering for the head, of various shapes and materials (as felt, silk, wool, straw), but having a *brim* as its most distinctive and general feature. Hats are of ancient origin. Among the Greeks, for instance, the *petasos* was worn, which had a brim, and was similar to the round felt now worn. The shape of the hat has varied extremely in Europe at different periods. The *dress hat* or *silk hat* with a smooth nap outside is the most important form of this article at present, though felt hats are perhaps in more general wear. The silk hat was invented at Florence about 1760. The manufacture, however, did not make much progress till 1828. Up to and even after this time beaver fur was the chief material for hats. A silk hat is composed of a

skeleton, to which the silk plush is glued. The skeleton, consisting of three parts, the cylindrical part or body, the crown, and the brim, is usually made of linen, covered with gumlac, and to the cylindrical part the crown is gummed. The cylindrical part is made by gumming together the edges of a piece of cloth shaped on a cylinder. The brim is composed of superposed layers of stiffer cloth, and made with a flat projecting surface round its inner edge, which is gummed to the skeleton. For covering the hat a sort of hood of silk plush is made, cut across in an oblique line. This cover is drawn over the skeleton on the block, and fitted exactly to it by the application of a hot iron. The heat of the iron melts the gumlac, which on cooling cements the covering to the skeleton. The edges of the oblique cut are also coated with gumlac. The hat is finally shaped on the block or form, and the plush dampened and polished, while the hat revolves on a turning lathe. In the manufacture of straw hats the straw commonly used is that of wheat or barley. The best comes from Italy, and particularly from Tuscany, but straw hats are also largely made in England.

Felt making for hats is an important and complicated industry. The furs used are from the beaver, and for the coarser hats fine wool is sometimes mixed in. The pelts reach the felting factory with the hair turned inside and as well preserved as possible. After a thorough washing they are dried out and sent to the furring machine, which consists of swiftly revolving wheels armed with knives which neatly shave the hair from the pelts. Back of the machine a suction pipe catches the fur and carries it swiftly to an upper floor where it is stored in bins and left there from six to ten years. This curing process dries out the fibers, giving them elasticity. When ready for use, the different kinds of fur are brought down to the mixing machine, known as the "devil." Here furs are mixed to make the various grades of hats. For instance, otter hair is heavy and expensive, and in order to make the best grade a lighter and cheaper coney or rabbit hair is added to it. From the "devil" the fur, all mixed for the grade of hats to be made, goes to a big bin, in the bottom of which there is a long, narrow slit. On one side of it, and below, there is a copper cone about four feet high which is perforated with a great number of small holes, Underneath the cone there is a swiftly revolving suction fan which sucks away the air through the holes with great force.

When the felt-hat maker is ready to begin work, he touches a lever and the perforated cone begins to revolve with tremendous velocity. The fur is shaken down from the bin and sifts slowly down the slit, falling upon the cone. Here it is held firmly by the suction, the fibers being crossed in every direction. When the cone has been entirely coated with fur a damp cloth is wrapped around it, a wire cone is substituted for the copper cone, and the embryo hat which is about four feet high and a foot or more across the base is carried away to the shrinking room. Here it is immersed for a few minutes in a bath of dilute sulphuric acid. Then it is taken out, rolled down and the fibers rubbed closer together. This continues until the felt cone has grown much thicker and smaller, resembling a dunce cap in shape. As soon as it has dried out it is sent to the dye room filled with copper vats, each of which contains rich dye stuff in liquid form. Here the hat is dipped and allowed to remain for some little time. Up to this time the dunce cap has been limp and flexible. To stiffen it, it is dipped into a bath made of shellac and alcohol. When it is dry, it is passed along to the shapers who give it the general form of a hat. This work is performed with the aid of a modification of a hydraulic press. The dunce cap, being first moistened and heated, is placed point down in a mold which is the size of the future crown. Inside of it a relaxed rubber bulb is crowded and then the upper part of the mold is brought slowly but forcibly downward. At the same time the bulb is slowly distended with steam which serves the double purpose of distending the crown and keeping it hot. The rim is spread out flat by the pressure on flanges which extend outward from the edges of the mold. When the hat comes from the press it resembles a sombrero and the felt is rough and woolly. After being dried, it goes to the hat shop proper where it is shaped for the trade.

The manufacture of each variety is a distinct industry in itself. The hat is first softened over a geyser of steam. In order to keep it in shape while this process is going on, a hat block, a piece of wood just the shape desired is inserted in the crown. When the hat has been sufficiently softened, a damp piece of ticking is placed over the crown and a flatiron, hollow on the inside and heated by means of a combined air and gas jet, is passed over it until the felt has yielded itself to the general shape of the block inside. The cloth is then quickly removed and the process of "pouching" begins. The workman first takes a small block to which a piece of emery paper is attached, and rubs the surface of the hat until the little rolls of felt peel off and the body becomes sleek and smooth. The hat is then singed over an alcohol lamp and is again "pouched" and the whole surface of the crown and brim, if the hat is light colored, is gently rubbed with vaseline to give it a deep, rich color. The sizes of the blocks vary from $6\frac{1}{2}$ to $7\frac{3}{4}$. The hat is now ready to go to the curling and setting department. A workman taps the crown of the hat, and if it is not stiff enough he paints it inside with a solution of shellac in alcohol, then places the hat, with the brim down, on a table before him. For curling the brim he uses a "shackle," a tool about four inches long. It is composed of two jaws of brass, the curves between which are exact counterparts of those to be imparted to the brim. The shackle is attached to a handle like that of a flatiron, and when it has been heated, the workman slips the hat brim, which has first been dampened so that it will not burn, into the jaws and it curls up into the

shape desired. The hat is then loaded on a rack and sent to a room where the bands, bows, and inside letters are put on. It then goes back to the ironing room where the rim is pared down with a little plane. Then the hat block is put into the crown and the hat is placed brim down on a long, hollow bench covered with canvas cloth. This is heated by means of a steam coil inside. Small bags of sand are placed around the hat rim, and when it has become soft and flexible, the brim is set by further shackling, and snapping into the brim a wire just the right size and shape. The hat goes back to the sewing room where a band is sewed around the edge of the brim. It then has little holes punched in the top or sides by means of a perforating press. The whole finishing process, including the necessary rests for drying, requires about three days.

Havan'a (Spanish, *La Habana*, "the haven"), an important maritime city, capital of Cuba, on the n. w. side of the island, with an extensive and excellent natural harbor. The staple manufacture is that of its celebrated cigars. The other manufactures, consisting chiefly of chocolate, straw hats, and woolen fabrics, are not of much consequence. The trade is extensive, the most important articles of export being sugar and tobacco, unmanufactured or in the form of cigars and cigarettes; other exports are molasses, coffee, wax, honey, rum. The U. S. has the principal share of the trade, and Spain and England rank next. Several railways start from Havana. The town was founded in 1511, but was only fairly begun in 1519. For a long time Spain derived most of her fleet from the building yards of Havana. Pop.1899, 235,981.

Havelock (hav'lok), Sir Henry (1795–1857), a British soldier. Having entered the army, he served with distinction in the Burmese War (1824–26). On the outbreak of the Indian mutiny he was despatched to Allahabad in order to support Sir H. Lawrence at Lucknow and Sir H. Wheeler at Cawnpore. On arriving at Cawnpore he found that Nana Sahib had massacred the prisoners. Pursuing his march to Lucknow, he defeated the rebels at Bithoor, and finally, with the aid of Outram, won the battle of Alumbagh. Having captured Lucknow, Havelock and Outram were shut up there until relieved by Sir Colin Campbell, Nov. 17, 1857. He died of dysentery at Dilkusha. He was raised to the rank of major general, made a baronet, and a Knight Commander of the Bath.

Haverhill, Essex co., Mass., on the Merrimac River, 33 mi. n. of Boston. Railroad: Boston & Maine. Has connections by electric system with a number of surrounding towns and cities. Town of Bradford was annexed in 1896. Industries: shoe, hat, paper, lasts, and leather factories. Surrounding country agricultural. Birthplace of John G. Whittier. Granite and bronze monument commemorating Hannah Dunston's slaughter of her Indian captors in 1697. The town was first settled in 1640 (Indian name "Pentucket"), became a city in 1870. Pop. 1900, 37,175.

Haverstraw, Rockland Co., N. Y., on w. bank of Hudson River, 37 mi. n. of New York. Railroads: N. Y. O. & W.; West Shore; and N. J. & N. Y. Steamers carry on an active trade with New York, and there are several foundries and manufactories. The manufacture of brick is extensive. Pop.1900, 5,935.

Havre (ä-vr), Le (formerly *Le Havre-de-Grâce*), a seaport of Northern France, dep. Seine-Inférieure, on the n. side of the estuary of the Seine, 108 mi. n.w. of Paris. The manufactures include chemicals, machinery, cotton goods, earthen and stone ware, paper, glass, oil, refined sugar, ropes, etc. A government tobacco factory employs 300 workmen; and a great number of vessels are built. But the chief dependence of Havre is on its commerce, which is the greatest of any French port next to Marseilles. It has a large trade with England and Germany, and especially with U. S., importing quantities of cotton and other produce.

Hawaii (or Sandwich Islands), a small archipelago in the North Pacific, named Sandwich Islands by Captain Cook after Lord Sandwich. The islands form a rich, beautiful, and interesting chain which runs from south-east to north-west, and lies in 19° to 20° N. lat. and 155° to 160° W. long. Their total area is about 7000 sq. m. The names and areas of the seven principal islands are as follows: Hawaii (the 'Owhyhee' of Captain Cook), Maui, Oahu, Kauai, Molokai (the 'Lepers Island'), Lanai, and Niihau. Hawaii is the southernmost of the group.

Geography.—The Hawaiian Islands are situated on the course of ships passing from San Francisco and Vancouver Island to China and Japan, as well as to New Zealand and Australia. The islands are of volcanic origin, with coral-reefs partly lining most of them, but entirely encircling none. They suffer from want of good harbors, the best being the harbor of Honolulu, situated on the island of Oahu, and the only really well-protected harbor in the group. The larger islands are mountainous, and contain some of the largest volcanoes, both active and extinct, in the world. The two highest mountains, Mauna-Kea and Mauna-Loa, are in the island of Hawaii, and are 13,805 and 13,675 feet high respectively. This island is also traversed by other mountains, which give it a rugged and picturesque appearance, and in places bold cliffs from 1000 to 3000 feet high front the sea. Speaking generally, however, the high ground in each of the islands is in the centre, and the mountains are divided by rich valleys leading down to a sandy shore. On the eastern slope of Mauna-Loa, in Hawaii, is the far-famed Kilauea, the largest active volcano in the world. It is over 4000 feet above sea-level. Its crater is of oval shape, 9 miles in circumference, bounded by a range of cliffs, and containing within it a fiery lake of molten lava rising and falling like the waves of the sea. Mauna-Loa itself is an active volcano, the scene of various eruptions. On Maui is the crater of Haleakala ("house of the sun"). Several of the islands, especially Hawaii and Kauai, are well supplied with rivers.

Climate, Vegetation, etc.—Lying as they do in the middle of the Pacific Ocean, the Hawaiian Islands, though within the tropics, enjoy a fairly temperate climate. In the hot season the temperature seldom rises above 90° F., while in the cool season it seldom falls below 52° F., the average temperature for the year being 74.3° F. Rains, brought by the northeast trade-wind, are frequent on the side of the mountains which face that quarter, but on the other parts of the islands little rain falls, and the sky is generally cloudless. The yearly rainfall at Honolulu, being on the leeward side of Oahu, is under 40 inches; that of the islands generally about 54 inches. The soil is generally thin and poor, but at the bases of the mountains there are extensive tracts as fertile as they are beautiful. Thousands of sheep find grazing ground; and on most of the islands, while the upland slopes of the mountains are clothed with dense forests, the lower levels are rich with sugar and rice plantations. The forest trees are mainly to be found on the windward, being the rainy side of the mountain ranges. Tropical fruits are numerous. The staple food of the natives consists of *poi*, a kind of thick paste made from the root of the *taro* plant and a raw or dried fish.

Labor Conditions.— The law which created Hawaii a territory provides that all Asiatics who have entered the island under contract since annexation are to be given one year to depart.

"The ordinary work on plantations is performed by unskilled labor, which may be divided into two classes—contract and free. Contract labor, consisting of Japanese, Chinese, Portuguese, Italian, Hungarian, Hawaiian, and others, is held under contract for three years when coming direct from foreign countries under agreement, and for the same or a shorter period when contracting after a previous sojourn in this country. Free labor, consisting of the same nationalities mentioned above, is employed by the day or month, without contract, and has come into the country as free labor, or has fulfilled a previous three-year contract and is then free to work where employment may be obtained. These laborers receive higher pay than contract men, and may be discharged at will, and the plantation owes him nothing but shelter and wages for work done. The contract man occupies quite a different position with reference to his employer. He is assured of steady work at a fixed sum per month. He can claim and receives not only unfurnished lodging for himself and family, but fuel, water, taxes paid, medical attendance, and certain other privileges; and for this he must work, when able, a certain number of days per month, wherever it pleases the employer, and fulfill in other respects the terms of his contract. When contract laborers are needed from abroad, application is made to the government for permission to import laborers of the desired nationality. * * * The quarters furnished by the plantation are grouped together in camps, located with reference to convenience to work, and for the most part with regard to drainage and sanitary conditions. From the contract-labor class the carpenter, blacksmith, engineers, and sugar boilers select their assistants, and these as they learn and become competent, obtain higher wages, often commanding from $30 to $60 per month. Generally the wages are paid between the third and the fifteenth of every month for the previous calendar month.

Hawaii

History.—The islands are said to have been discovered by Gaetano in the year 1542, and rediscovered by Captain Cook in the year 1778. Cook met his death at the hands of the natives in Kealakekna (Karakakoa) Bay in the year 1779. In early times each island had a king, but under Kamehameha I. the islands were formed into one kingdom. He died in 1819, and was succeeded by Liholiho, who adopted on his accession the name of Kamehameha II., and whose reign was famous for the abolition of idolatry simultaneously throughout all the islands. Vancouver, who arrived with Cook in 1778, and returned in 1792 and again in 1794, had made sincere attempts to enlighten the islanders, and succeeded so far that he was requested by the king and his chiefs to send out religious teachers to them from England. The first missionaries, however, who visited the islands came from America in 1820. The missionaries were well received, and the work of instruction was at once begun. Kamehameha II. and his queen visited England, and both died in London in July 1824. Prior to the year 1838 the government was a simple despotism, but in 1840 Kamehameha III. granted a constitution consisting of king, assembly of nobles, and representative council. In 1843 the independence of the Hawaiian kingdom was formally guaranteed by the French and English governments. Kamehameha IV. (1854–63) was succeeded by his brother Kamehameha V., with whose death in 1873 the line of the Kamehamehas became extinct, a high chief, Lunalilo, being elected to the vacant throne. On his death in 1874 another high chief, Kalakaua, was elected king. This ruler died in 1891, and his successor, Queen Liliuokalani, was deposed Jan. 14, 1893. A provisional government was then formed and overtures made for annexation to the United States. President Cleveland opposed the annexation and the Republic of Hawaii was proclaimed July 4, 1894, with a constitution modeled after that of the U. S.

Repeated efforts were made to annex the islands, and in January, 1898, Sanford B. Dole, President of Hawaii, visited Washington in the interest of annexation. The treaty could not get the necessary two-thirds vote and the friends of annexation proposed a joint resolution of Congress which would require but a majority vote. This was passed and signed by the President July 7, 1898. In accordance with the resolution the President appointed a commission to visit the islands and draw up a plan of government for the islands. The U. S. took formal possession of the islands August 12, 1898. The act of Congress approved April

30, 1900, made provision for a territorial government, and under this act Sanford B. Dole, formerly president of the provisional government, took the oath of office as governor on June 14, 1900. The first census of the Hawaiian Islands was taken in 1832, and was followed by censuses in 1836, 1850, 1853, and 1860. These censuses were simple and rudimentary in character. Censuses at regular periods of six years were provided for in 1865, the same to begin with 1866. Accordingly a census was taken every six years from 1866 to 1896, inclusive. The census of 1900 was taken as a part of the regular census of the United States. The following table shows the population of the islands at each census from 1832 to 1900, together with the increase (or decrease) by number and per cent during each decade:

Census.		Increase.	
Years.	Population.	Number.	Per cent.
1900	154,001	44,981	41.2
1896	109,020	19,030	21.1
1890	89,990	9,412	11.6
1884	80,578	22.593	38.9
1878	57,985	1,088	1.9
1872	56,897	*6,062	*9.6
1866	62,959	*6,741	*9.6
1860	69,700	*3,438	*4.7
1853	73,138	*11,027	*13.1
1850	84,165	*24,414	*22.4
1836	108,579	*21,734	*16.6
1832	130,313	.....	.....

* Decrease.

Each census from 1832 to 1872 showed a decrease, the total loss during that time amounting to 72,416, or 56.3 per cent of the population as returned by the census of 1832. During the decade from 1890 to 1900 the rate of increase has been 71.1 per cent. The total land surface of the islands is, approximately, 6,449 square miles, the average number of persons to the square mile at the last three censuses being as follows: 1890, 13.9; 1896, 16.9; 1900, 23.8.

The population in 1900 by islands was as follows:—

Island.	*Population.*
Hawaii	46,843
Kauai	20,562
Niihau	172
Maui	25,416
Molokai } Lanai }	2,504
Oahu	58,504

Honolulu in Oahu island is practically the only city in the islands. It had a population in 1900 of 39,306, an increase since 1890 of 16,399, or 71.5 per cent.

Education in Hawaii.— The following facts regarding the status of education in the Hawaiian Islands are drawn from the report of the United States Commissioner of Education for the fiscal year ending June 30, 1900. It appears that the first missionaries in Hawaii

Hawaii

in 1820 taught the natives the alphabet, and many of the latter learned to read English before their own language was reduced to written form. After this was effected, before the end of 1824, 2,000 people had learned to read in their own languages, and a system of schools was extending over the islands, the people were eager to learn reading and writing, and at length nearly the whole population went to school. After this early enthusiasm had exhausted itself, in 1831 a high school was organized for training teachers. This was the Lahainaluna Seminary, which is still in existence. Hilo boarding school for boys dates from 1836, as well as a boarding school for girls, and in 1839 an industrial school for boys was opened. Numerous mission schools have sprung up from time to time. Other institutions which have had influence are the Oahu Charity school (1833), which became finally the Honolulu High School, the principal function of which was to teach the half-whites English; the Royal school (1840) for chiefs, which subsequently became a school for all Hawaiian boys, and was the leading school for teaching English; and Punahou school (1841) for the children of missionaries, which was chartered as Oahu College in 1853. In 1839 the Roman Catholic missionaries established their system of schools. In 1840 the first comprehensive written laws were published, and they included a compulsory school law, with penalties for both parent and child for noncompliance with the law. The law provided also that no illiterate man should "hold office over any other man," nor could an illiterate man or woman marry. A minister of public instruction was among the functionaries provided by the new law.

In 1855 a board of education was established in place of the minister of public instruction, and in 1865 an inspector generalship of schools was created. In 1876 the reciprocity treaty with the United States ushered in the era of commercial progress. The influx of foreigners, especially of English-speaking ones, and the increase of business made English more and more the language of business, and the necessity of teaching it in the schools became more and more apparent. English, therefore, became the language of the two principal schools, and its use soon spread to other schools.

In 1884 there were forty-four day schools, with 100 teachers, in which English was the language of instruction. In 1883 the St. Louis College for boys was opened under the care of the Brothers of Mary, who had come to work in the Roman Catholic schools. This college had 245 students in 1884. At this time English was essentially the sole language of the private schools, employing 106 teachers, but was used in less than half the public or common schools. In 1888 all government schools were made free, and the attendance rose to 8,050, the total number in both government and independent schools being 11,307. Since then nearly all the common schools, in which the Hawaiian language was the medium of instruction, have been converted into schools in which English

alone is so employed, 98 per cent of the children being at present instructed by teachers who use English.

The following table shows the statistics of schools in 1899 : —

Schools.		Teachers.			Pupils.		
Kind.	Number.	Male.	Female.	Total.	Male.	Female.	Total.
Public....	143	113	231	344	6,345	5,041	11,436
Private ..	46	79	121	200	2,256	1,798	4,054
Total...	169	192	352	544	8,651	6,839	15,490

Of the 15,490 pupils, 5,045 were Hawaiian, 2,721 part Hawaiian, 601 American, 213 British, 337 German, 3,882 Portuguese, 84 Scandinavian, 1,141 Japanese, 1,314 Chinese, 30 South Sea Islanders, and 124 other foreigners. Each nationality had its own teacher. The expenditures for the two years ending December 31, 1899, were $575,353.

Bubonic Plague.—The bubonic plague broke out in Honolulu in the latter part of 1899. On January 1, 1900, thirteen cases existed. The portion of the city in which the plague thrived was condemned by the board of health, and several of the tenements in the Chinese quarter were set on fire. The fire got beyond the control of the fire department, and thirteen blocks of buildings were destroyed and thousands rendered homeless. The liability of the government for the loss of property amounted to $1,000,000. A system of close inspection was adopted, and food stuffs from infected Asiatic ports were prohibited. As a result, no new cases have been reported since July.

Hawaii Becomes a Territory.—On February 16, a bill to erect the Hawaiian Islands into a territory of the United States was introduced in the Senate. It was provided that the territory when organized would be on about the same footing as Arizona or New Mexico, with a governor appointed by the President, and with a territorial representative in Congress. This bill was passed March 1. The house of representatives passed a substitute bill April 6. This bill, which was accepted by the senate, provided that the extension of the United States coastwise navigation laws should be postponed for one year; Chinese to be excluded from the United States, even though they have obtained admission to Hawaii; all Asiatics who have entered the island under contract since annexation, to be given one year to depart; liquors shall not be sold in saloons: no corporation may hold more than 1,000 acres of land. This bill was signed by President McKinley April 30, and on the 4th of May Sanford B. Dole, formerly president of the Hawaiian Republic, was nominated for territorial governor of Hawaii. Henry E. Cooper, formerly Hawaiian minister of foreign affairs, was appointed secretary.

Hawaii

By the terms of the act which created Hawaii a territory of the United States, Honolulu is the capital; all persons who were citizens of the Republic of Hawaii on the 12th of August, 1898, are declared to be citizens of the United States and of the Territory of Hawaii; the constitution and laws of the United States have the same force and effect as elsewhere in the United States, except where inapplicable or specifically excepted; the laws of Hawaii not inconsistent with the laws and constitution and laws of the United States and the provisions of this act shall continue in force; and the elective laws of the Republic of Hawaii are abolished. All legislative proceedings are to be conducted in English, and the legislature, its members, general elections, qualifications of officers, etc., are like those of Arizona and New Mexico. There is an educational qualification for voters; namely, voters must be able to speak, read, and write the English or Hawaiian language. A delegate to the house of representatives of the United States, to serve during each Congress, shall be elected by the voters qualified to vote for members of the territorial legislature. Such delegate shall have the right of debate in the house, but not the right to vote. General elections are to be held every second year beginning with November, 1900.

First Election.— The first general election was held November 6, 1900, and resulted as follows:—

For delegate to serve the remainder of the 56th Congress, Robert W. Wilcox, the Independent candidate, received 3,990 votes; Samuel Parker, the Republican, received 3,783 votes. And David Kawananakoa, the Democrat, received 1,567 votes. Wilcox was elected by a plurality of 207 votes. The same candidates were voted for as delegate to the 57th Congress, and Wilcox received a plurality of 246 votes.

Members of the legislature were elected at the same time, the Independents carrying the election. They elected 9 senators and 16 representatives against 6 senators and 7 representatives by the Republicans, and 1 representative by the Democrats, and have a majority of 11 on joint ballot.

According to reports the Independents are for the most part those who were barred on account of a small property qualification, from participating in elections before the islands were annexed to the United States. It is said they do not represent the best interests of the islands, and are in favor of nullifying the annexation. The predominance of this party in Hawaii presents a problem of no little importance. The total number of registered voters was 11,216.

The first session of the legislature was opened March 1, 1901. J. A. Akina (Ind.) was chosen speaker of the house and Dr. Nicholas Russell was elected president of the senate. The territorial secretary, whose duty it is to "record and preserve the laws and proceedings of the legislature," was ordered by the members to leave the house.

Hawk, a name often applied to all birds of prey except the eagles, vultures, and owls. It thus includes the falcons as well as the hawks proper, the latter being distinguished from the former chiefly by their shorter wings, which do not reach the extremity of the tail, and have the fourth quill longest and the first short; their beaks also are less robust, and lack the tooth-like notch of the former.

Hawkins, ANTHONY HOPE, b. 1863 in London. He graduated from Baliol College, Oxford, in 1880, and was admitted to the bar in 1887. His literary career began with a book entitled *A Man of Mark*, under the name of "Anthony Hope." Later he published *Father Stafford*, *Mr. Witt's Widow*, and wrote stories for *St. James Gazette* and *Sport Royal*. In 1893 he produced the *Prisoner of Zenda;* this was followed by *Phroso*, and *Heart of Princess Osra*.

Hawthorn, or Whitethorn, a small spiny European tree, rising sometimes to the height of twenty to twenty-five feet. The leaves are alternate, obovate, 3 to 5 lobed; the flowers are white, sometimes with a reddish tinge, and possess an agreeable perfume; the fruit is a drupe of a red color, and is edible. A number of them belong to the U. S. When young the hawthorn springs up rapidly, and if pruned grows into a thick hedge. The double flower kind is one of the most ornamental for shrubberies. Hawthorn blossom is often called *May*, from the time of its flowering in England.

Hawthorne, NATHANIEL (1804–1864), b. at Salem, Mass. He studied at Bowdoin College, where he took his degree in 1825 along with Longfellow and Franklin Pierce. For a number of years after this he led a retired and studious life in Salem, writing tales, some of which appeared in newspapers and magazines. In 1837 appeared his *Twice-told Tales*, a collection of stories which he had contributed to various American periodicals. In 1838 he was appointed a weigher in the Boston customhouse, a post which he held for a few years. In 1842 he married Miss Peabody of Salem, Mass. From 1846 to 1849 he was surveyor of the customhouse. When Pierce became president he was appointed consul to Liverpool. In 1846 he published his *Mosses from an Old Manse;* in 1850, *The Scarlet Letter;* in 1851, *The House of the Seven Gables;* and in 1852, *The Life of President Pierce*, and the *Blithedale Romance*. In 1853 he became American consul at Liverpool, a post which he held until 1857. He died at Plymouth, New Hampshire. Other works are his *Transformation* (1860), *Our Old Home* (1863), etc. Hawthorne possessed a rare literary style. JULIAN, son of the above, b. 1846, also a novelist. In addition to a biography of his father, he has written the novels of *Bressant*, *Idolatry*, *Fortune's Fool*, etc.

Hay, JOHN, diplomatist, was b. at Salem, Ind., in 1838. He graduated from Brown University in 1858; studied law and was admitted to the bar at Springfield, Ill., in 1861. The same year he left Illinois to become the assistant secretary of President Lincoln, and subsequently his adjutant and aid-de-camp, positions which bore fruit in the *Life of Abraham Lincoln*, written by him in conjunction with Nicolay. He took an active part in the Civil War, rising to the rank of colonel and assistant adjutant general. From 1865 to 1870 he was secretary of a number of foreign legations, by which service he gained considerable diplomatic experience, In 1870 he returned to the U. S. and began his newspaper work as one of the editors of the New York *Tribune*. In 1881 he was appointed assistant secretary of state. He was appointed by President McKinley U. S. ambassador to Great Britain, in 1897. As an author his dialect poetry and other works have made him more than a passing name. In August, 1898, he was appointed secretary of state to fill the vacancy caused by the resignation of William R. Day.

Hay, the stems and leaves of grasses and other plants cut for fodder, dried in the sun, and stored usually in stacks. The time most suitable for mowing grass intended for hay is that in which the saccharine matter is most abundant in the plants, viz., when the grass is in full flower. For the operation of mowing, dry weather, and, if possible, that in which sunshine prevails, is chosen. The making of the grass into hay generally takes three or four days to get it ready for stacking. This period is principally occupied in alternately *tedding* (i. e., shaking out the grass loosely) and gathering it up into cocks or small heaps, previous to stacking. Care must be taken to avoid hay making either under a scorching sun or during the prevalence of rain, and the cocks should never be opened in the morning until the disappearance of the dew. In stacking the great object is to preserve the freshness of the herbage, and to induce a slight degree of fermentation. If the weather has been wet a few layers of straw may be inserted at intervals. Salting is also recommended.

Haydn (hī′dn), JOSEPH (1732–1809), a celebrated German musical composer, b. at Rohrau, on the borders of Hungary and Austria. At the age of six he was sent to school at Haimburg, where he learned, among other things, singing and playing by rote. On account of the excellence of his voice he was appointed a choir boy at St. Stephen's Church, Vienna. At the age of sixteen his voice began to break, and he lost his situation as a chorister. Having made the acquaintance of Metastasio. Porpora, and Gluck, Haydn gradually attracted public attention, was appointed organist to two churches, and obtained many pupils. From 1761 to 1790 he was musical director to Prince Esterhazy, and composed during this period a great number of works, including some 120 symphonies for the orchestra, 12 operas, etc. In 1791 and 1794 he visited England, staying there nearly three years altogether, and writing his opera *Orpheus and Eurydice*. In 1798 he published his oratorio of the *Creation*, and in 1800 that of the *Seasons*. His old age was exempt from pecuniary troubles, and he was surrounded by appreciative friends. His last public appearance was at a performance of his *Creation* in 1808.

Haydn's principal merit consists in his opening up a new development of instrumental composition, of which his 125 orchestral symphonies furnish abundant proof. He may be said to be the originator of the symphony and of the stringed quartette.

Hayes, Rutherford B. (1822–1893), nineteenth president of the U. S. He was a successful practitioner of the law until in 1861, at the outbreak of the Civil War, he was made major of volunteers. His conduct on the field was marked by conspicuous gallantry, and he attained by meritorious service the rank of brevet major general. In 1865 he was elected a member of Congress, where he won the reputation of a working member. In 1867, 1869, and 1875 he was elected governor of Ohio. In 1876 he was nominated for the presidency. An electoral commission, appointed by Congress, was required to decide the result of the election, which declared in favor of Mr. Hayes. His administration was conciliatory toward the South, and earnest in its efforts for the reform of the civil service. After his retirement from the presidency his life was one of good works.

Hayes, Isaac Israel (1832–1881), American Arctic explorer. He was a member of the expedition of 1853–55 under Dr. Kane, and himself commanded an expedition in 1860–61. He served as an army doctor during the war, and in 1869 he visited Greenland. He wrote *The Open Polar Sea*, and *The Land of Desolation.*

Hay Fever (or Hay Asthma), a complaint caused by the odors of flowering grasses, of a stable, or of certain drugs, such as ipecacuanha. Removal from the cause of the disease is beneficial, so are the smoking of tobacco, the inhalation of vapor of creosote, etc.

Hayti (Haiti, or San Domingo) (originally *Española;* Latin, *Hispaniola*), one of the West Indies, after Cuba the largest and one of the most fertile of these islands. It lies s.e. from Cuba, and is separated from it by the Windward Passage, 50 mi. broad. Its length is 400, and breadth 150 mi.; area about 28,000 sq. mi., or nearly as large as Scotland. It is of irregular form, and is intersected west to east by three chains of mountains, connected by offsets, with extensive plains and savannahs between. The central chain contains the highest peak, Loma Tina, 10,200 ft. The principal plain is the fertile Vega Real, between the northern and central ranges. The rivers are numerous, but of small size. The minerals include gold, silver, quicksilver, etc., but are greatly neglected. Hayti as a whole is one of the healthiest of the West Indian Islands. The seasons are, a wet, during which heavy rains are most frequent in May and June; and a dry, during which little or no rain falls. The flora includes pines, mahogany trees, fustic, satinwood, lignum vitæ, and other cabinet and dye woods, plantains, bananas, yams, batatas, oranges, pineapples, etc. The staple cultivated products are: coffee, sugar, indigo, cotton, tobacco, and cacao. The fauna includes the agouti, European cattle and pigs run wild, snakes, caymans, turtles, etc.

Among the principal towns in Hayti are Port-au-Prince, San Domingo, Jacmel, and Cape Haytien.

Hayti was discovered by Columbus in 1492. It was then inhabited by perhaps 2,000,000 natives, but so ruthlessly did the Spaniards deal with the aborigines that within a century they practically exterminated them, having introduced negro slaves in their place. In 1630 the French settled in the western part of the island, and in 1697 the western portion was ceded to them, while the eastern remained Spanish. In 1791 the negroes revolted against France, and latterly the whole island came under the negro leader, Toussaint L'Ouverture, who established an independent republic. He was captured, but in 1803 Dessalines headed a new insurrection, drove out the French, and was crowned emperor of Hayti. He was assassinated in 1806, and the Spaniards regained the eastern portion of the island. In 1821 the Spanish portion declared itself independent of the mother country, and assumed the name of Spanish Hayti; but it was subjugated by Boyer, the president of the Haytian Republic, or French Hayti. In 1844 the inhabitants of the Spanish portion rose and formed themselves into a republic under the name of San Domingo (Republica Dominica). In 1861 Santana negotiated a reunion of the state with Spain, but Spain evacuated the island in 1865. From that period its history has presented an almost uninterrupted scene of revolution and bloodshed. It now comprises the Republic of Hayti on the west side of the island, and the Dominican Republic on the east. Port-au-Prince is the capital of Hayti, and the pop. of the republic is roughly estimated at 780,000, consisting of negroes and mulattoes. San Domingo is the capital of the Dominican Republic, and the pop. of the latter state is est. at 500,000, consisting also of negroes and mulattoes, with a considerable admixture of whites. In Hayti French is the prevailing dialect; in the Dominican Republic, Spanish. The area of the former comprises 10,204 sq. mi.; that of the latter, 18,045 sq. mi.

Hazaribagh (h*a*-zär-i-bäg′), chief town of the district of the same name, in Chota Nagpur, Bengal. Pop. 15,306. The district contains 7,021 sq. mi. Pop. 1,104,742.

Hazel, a genus of shrubs or small trees. It belongs to Europe, North Africa, Asia, and North America. The European hazel produces the nuts called filberts, and grows best in a tolerably dry soil. It bears male and female flowers, the former composing cylindrical catkins. The hazelnut oil is little inferior in flavor to that of almonds. Hazel branches form excellent walking sticks, fishing rods, etc., and the wood produces good charcoal, often employed by painters. The American hazel very much resembles the European. The roots are used by cabinetmakers for veneering; and in Italy the chips are sometimes put into turbid wine for the purpose of fining it.

Ha′zeline, an alcoholic liquid distilled from the fresh leaves of the witch-hazel, native to the U. S. It is exceedingly useful as an ap-

plication to wounds, stanching the bleeding and promoting healing. It is equally useful for bruises, inflammatory swellings, sprains, and the like. It is applied on a pledget of lint to bleeding piles. In internal bleeding, whether from the lungs, stomach, or bowels, it gives very satisfactory results. There are several officinal preparations of the witch-hazel, a fluid extract and a tincture, the dose of the former being 15 to 60 drops, and of the latter 2 to 5.

Common Hazel: *a.*—Male, and *b.*—female flowers; *c.*—fruit.

Hazelton, Luzerne co., Pa., 22 mi. w. of Wilkesbarre. Railroad, Lehigh Valley. It is an extensive coal mining town, being surrounded by very large anthracite collieries. Among the industries are a foundry, brush factory and coffin works. Population 1900, 14,230.

Hazlitt, WILLIAM (1778–1830), English critic and essayist, son of a Unitarian minister. In 1793 he became a student in the Unitarian College, Hackney, but on leaving it devoted his time to portrait painting. This was in its turn renounced for literature, his first publication being an essay *On the Principles of Human Action*, 1805. He delivered various series of lectures, and contributed to the *Edinburgh Review*, etc. Among his chief works are, *Characters of Shakespeare's Plays*, *A View of the English Stage*, *Lectures on the English Poets*, *Lectures on the English Comic Writers*, *Table Talk*, *Lectures on the Elizabethan Age*, *Life of Napoleon Bonaparte*, and essays, written in conjunction with Leigh Hunt, published under the title of the *Round Table.*

Head, the term applied to the anterior part of the body of an animal when marked off by a difference in size, or by a constriction (neck). See *Anatomy.*

Health is that condition of the living body in which all the bodily functions are performed easily and perfectly, and unattended with pain. The most perfect state of health is generally connected with a certain condition of the bodily organs, and well marked by certain external signs. See *Sanitary Science.*

Heart, a hollow muscular organ, the function of which is to maintain the circulation of the blood, the organs of circulation being the heart, the arteries, the veins, and the capillary vessels. The heart in men, quadrupeds, birds, and some reptiles is composed of four cavities, two *auricles* and two *ventricles.* It is enveloped in a membrane called the *pericardium*, and is situated toward the left of the chest, between the lungs. See *Anatomy.*

Heat, the name given to a peculiar sensation, and also to the agent producing it, this being now believed to be a certain motion in the minute molecules composing all bodies.

One of the most obvious effects of heat is to alter the *temperature* of bodies. In almost all cases when heat is supplied to a body, the temperature of the body rises, and when heat is removed the temperature of the body falls. If the increase of temperature is evident, and such as may be noted by the thermometer, the heat is then termed *sensible;* if not, as in the case of ice immediately melted, it is termed *latent.* The terms *capacity for heat* and *specific heat* are used in relation to this property of bodies. The capacity for heat of a body is the quantity of heat required to raise its temperature 1° from some fixed point, as from 32° F. The specific heat of a substance is the ratio between the quantity of heat required to raise the temperature of the substance 1° from some fixed point and the quantity of heat required to raise the temperature of an equal mass of distilled water 1° from 32° F.

Heat changes the *dimensions* of bodies. Increase of volume is the normal effect, although the reverse is observed in water between 32° F. and 39° F., and in iron and bismuth. Between moderate limits bodies expand nearly regularly with the temperature, but this does not hold good of the more extreme limits. Addition of heat *liquefies solid bodies*, and converts *liquids into gases.* During the conversion of a solid into a liquid, or a liquid into a gas, a considerable quantity of heat is absorbed, and in the reverse process heat is given out; but this is one of the cases in which, though heat is taken in or given out, the temperature is not altered. Hence the heat is said to be made *latent.*

In measuring quantities of heat various units may be adopted, as, for instance, the quantity necessary to melt a pound of ice. *Calorimetry* is the technical name given to the part of the subject that deals with the practical measurement of quantities of heat.

Radiation of heat consists in the propagation of heat from a hotter body to a colder one through an intervening medium which is not heated during the process. The heat is transmitted by the same medium that transmits light from a luminous body. Radiant heat and light are, in fact, the same thing, namely, vibrations of an elastic medium, the luminiferous ether, supposed to fill all space, and they obey the same laws of reflection, refraction, interference, and polarization. They also obey the general laws of wave-motion.

That heat is a form of energy is now considered by all to be beyond question. Every substance is considered to have some kind of molecular structure, and heat is regarded as consisting in the relative motions of the molecules or particles. The greater the energy of the motion the higher the temperature of the body, so long as it maintains its original state, solid, liquid, or gaseous; and an alteration in the nature of the motion probably constitutes the change from one of the states of matter to another. After the time of Rumford and Davy, Fourier, and Carnot were highly distinguished for their inquiries into the mathematical theory of heat. Fourier investigated the theory of conduction and radiation, while on the investigations of Carnot has been founded the branch of thermo-dynamics which treats of the conversion of heat into mechanical force or energy, and *vice versa*. The investigations of Joule and the discovery of the quantitative equivalence of energy with heat, led to the enunciation of the theory of the *conservation of energy*.

Heath, the common name of many plants. Those that belong to the genus *Erica* have their leaves simple and entire; their flowers oval, cylindrical, or even swelled at the base; the corolla is four-cleft; the stamens eight, ter-

Heaths.

minated by anthers, which are usually notched or bi-aristate at the summit, and the fruit dry, four- or eight-celled. From 400 to 500 species are known, twelve or fifteen of which inhabit Europe and have small flowers, while all the remainder are natives of South Africa (the vicinity of Cape of Good Hope). Many of them bear brilliantly colored flowers.

Heathfield, GEORGE AUGUSTUS ELLIOTT, LORD (1718–1790), a British general, famous for his defense of Gibraltar from 1779 to 1783.

Heat Spectrum, the part of the spectrum from an incandescent body that contains invisible heat rays. To produce the heat spectrum properly lenses and prisms of rock salt must be employed. When the spectrum from the sun is examined, it is found that the maximum heat intensity is in the dark-heat spectrum at a considerable distance from the place where light ceases to be perceptible.

Heaven (probably signifying that which is *heaved* up or elevated), in a physical sense, the azure vault which spreads above us like a hollow hemisphere, and appears to rest on the earth at the horizon. It is in reality merely the appearance presented to us by the immeasurable space in which the heavenly bodies move. A theory recently broached assigns the azure color to the presence of particles of dust in the air. In theology, this word denotes a region of the universe where God's presence is especially manifested, in contrast with the earth. Among Christians the general opinion is that heaven is the residence of the Most High, the holy angels, and the spirits of just men made perfect, that this abode is eternal, and its joys intensely spiritual.

Hebe, in Greek mythology, the goddess of youth, and the cup-bearer to the gods, until replaced by Ganymede, a daughter of Zeus and Hera, who gave her as a wife to Heracles. In the art she is represented with the cup in which she presents the nectar, under the figure of a charming young girl, her dress adorned with roses, and wearing a wreath of flowers.

Hebrew Language and Literature, the language of the Jews, Israelites, or Hebrews, especially at that period when they formed a compact nation inhabiting Canaan or Palestine. The Hebrew language forms a branch of the Semitic family of languages, being akin to the Aramaic (Chaldee and Syriac), Arabic, Ethiopic, and Assyrian. In the antiquity of its extant literary remains Hebrew far surpasses the other Semitic idioms, and in richness and development is only inferior to the Arabic. The language is deficient in grammatical technicalities, especially in moods and tenses of the verb, in the absence of the neuter gender, etc. The alphabet is composed of twenty-two consonants, the vowels being expressed by marks above or below these letters. The accents and marks of punctuation amount to about forty. The writing is from right to left. There are three kinds of Hebrew alphabet now in use—the square or Assyrian (properly called the Babylonian), the most common; the rabbinical, or mediæval; and the cursive, or alphabet used in ordinary writing.

The extant classical Hebrew writings embrace a period of more than 1,000 years from the era of Moses to the date of the composition of the books of Chronicles, which stand last in the Hebrew Bible. During this period the written language underwent surprisingly little change. In passing from the book of Genesis to the books of Samuel we do not recognize any very striking difference in the language. Even those who assert that the Pentateuch as a whole is of a comparatively late era, admit the great antiquity of some of its contents, which do not differ in language from the rest. The writings which belong to the age subsequent to the Babylonish captivity differ very considerably from those which belong to the

preceding age; the influence of the Aramaic or Chaldee language, acquired by the Jews in the land of their exile, having greatly corrupted their tongue. The historical books belonging to this age are the books of Chronicles, Ezra, Nehemiah, and Esther. In the prophets who prophesied during and after the captivity, with the exception of Daniel, the Aramaic impress is by no means so strong as we might anticipate, they having evidently formed their style on that of the older prophets. At what time Aramaic became the dominant element in the national language it is impossible to determine, but latterly it took the place of the old Hebrew as a spoken tongue. The fragments of the popular language in the New Testament are all Aramaic; and ever since the Hebrew proper has been preserved and cultivated only as the language of the learned and of books and not of common life.

After the return from the captivity, the Jewish literature was carefully cultivated. Under Ezra the Scriptures were collected and arranged into a canon. The Pentateuch was publicly read, taught in schools, and translated into Aramaic. The legal or religious traditions explanatory or complementary to the law of Moses were collected and established as the oral law. These labors resulted in the Midrash, a general exposition of the Old Testament, divided into the Halacha and the Haggada. To the Maccabean era belong the Apocrypha (in Greek), various Greek versions of the Bible, and several collections of prayers, poems, and proverbs. To the succeeding epoch belong some celebrated doctors of law—Hillel, Shammai, Gamaliel, and others; while the age following the destruction of Jerusalem (A. D. 70) witnessed the completion of the New Testament and the works of Josephus, written, however, in the Greek language. On being driven from their capital by the Romans, numerous schools were established by the Jews in which their language and literature were taught. Of these schools the most celebrated were those of Babylon and Tiberias. The Mishna, which contains the traditions of the Jews and interpretations of the Scriptures, is supposed to have been compiled in the latter part of the second or in the earlier part of the third century; and the rabbis of Tiberias and Babylon wrote numerous commentaries on it. These commentaries were at length collected into two separate works, the Jerusalem and the Babylonian Talmuds. The Jerusalem Talmud seems to have been completed about the end of the fourth century, and the Babylonian Talmud about a century later, under the care of Rabbi Ashe. What was called the *Targums*—that is, Aramaic translations of portions of the Old Testament—belong partly to times somewhat anterior, partly to times subsequent to this period. The Jews latterly adopted the languages of the various peoples among whom they happened to dwell, though they also wrote in classical Hebrew as well as in the less pure form of the *Rabbinical* Hebrew. The most brilliant epoch of mediæval Jewish literature is that of the domination of the Moors in Spain. Of modern literature in the Hebrew language, there is little that is of general interest.

Hebrews. See *Jews.*

Heb′rides (or Western Islands) (the *Heboudai* of Ptolemy, and *Hebudes* of Pliny, the *r* being an erroneous insertion), a series of islands and islets off the west coast of Scotland, usually divided into the Outer Hebrides (popularly called the Long Island), of which the principal are Lewis and Harris, North Uist, Benbecula, South Uist, and Barra; and the Inner Hebrides—Skye, Mull, Islay, Jura, Coll, Rum, Tiree; Colonsay, etc. The Hebrides are divided between the shires of Ross, Iverness, and Argyle. They number upward of 400 in all, but only about 90 are inhabited. Area, about 2,800 sq. mi.; pop. 82,000. The islands are, on the whole, mountainous, and abound in moss and moor. Although humid, the climate is mild. The soil is mostly poor, and agriculture, except in certain localities, especially Islay, is very backward. Oats and barley, with potatoes and turnips, constitute almost the entire produce of the soil. Cattle rearing and fishing are staple industries.

He′bron (anciently *Kirjath-arba* or *Mamre*, now *El-Khalil*), a town in Palestine 18 mi. s. by w. of Jerusalem, 2,835 ft. above sea level. It lies in the narrow valley of Mamre, and was one of the three cities of refuge west of the Jordan. Its streets are narrow and dirty. A mosque, called *El-Haram*, formerly a church, contains the alleged tombs of Abraham, Isaac, Jacob, Sarah, etc. Hebron is one of the oldest of existing towns. It was the residence of Abraham and the patriarchs, and at one time of David. Pop. about 10,000.

Hec′ate, an ancient Greek goddess, whose powers were various. She could bestow wealth, victory, and wisdom; good luck on sailors and hunters; prosperity on youth and on the flocks. She was latterly confounded with other divinities, such as Demēter, Artĕmis, and Persephŏnē (Proserpine), and finally became especially an infernal goddess, and was invoked by magicians and witches. Dogs, honey, and black female lambs were offered to her at places where three roads met. She was often represented with three bodies or three heads, with serpents round her neck.

Heckles (or Hackles), an apparatus employed in the preparation of animal and vegetable fibers for spinning. It consists of a series of long metallic teeth, through which the material is drawn so as to comb the fibers out straight and fit them for the subsequent operations. The teeth are fixed in a wooden or metallic base, in several rows, alternating with each other at short distances apart.

Hecla (or Hekla), a volcano of Iceland, about 20 mi. from its s.w. coast, about 5,000 ft. in height, and having several craters. It is composed chiefly of basalt and lava, and is always covered with snow. Many eruptions are on record. One of the most tremendous occurred in 1783, after which the volcano remained quiescent till September, 1845, when it again became active, and continued with little inter-

mission till November, 1846, to discharge ashes, some masses of pumice stone, and a torrent of lava. The last outbreak was in 1878.

Hector, the son of Priam and Hecuba, the bravest of the Trojans, whose forces he commanded. His wife was Andromache. His exploits are celebrated in the *Iliad*. Having slain Patroclus, the friend of Achilles, the latter sought revenge, and Hector was slain by him. The body of Hector was dragged at the chariot wheels of the conqueror; but afterward it was delivered to Priam for a ransom, who gave it a solemn burial. Hector is the most attractive warrior in Homer's *Iliad*, in which one of the finest episodes is his parting from Andromache before his last combat.

Hec′uba, of Phrygia, in Greek legend, the second wife of Priam, king of Troy, to whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus, and, according to one form of the legend, in despair leaped into the Hellespont.

Hedge, a fence formed of living trees or shrubs. Hedges are often composed of one or more of the following: hawthorn, crab, blackthorn, holly, privet, beech, hornbeam, maple, barberry, furze, broom, alder, poplar, willow, yew, box, arborvitæ, sweet briar, etc. Although superior to dry stone walls, they take up much room, and exhaust the soil to some extent. Hedges are probably more common in England than in any other country. It has been calculated that judicious trimming of hedges would increase the cultivated land in England and Wales by 490,000 acres, an effect similar to the addition of a new county of moderate size. They were not very common in England till the close of the seventeenth century.

Hedgehog, an animal, covered with spines in lieu of hair. By means of a special muscle it is able to roll itself up into a ball, and in this form can defy most of its enemies. It has a rudimentary tail, elongated nose, short ears, with a cranium comparatively broad. The hind feet have five toes, and strong, coarse hair covers some parts of the body. The teeth

Hedgehog.

are numerous. Including the tail, it attains a length of 11 in. It usually resides in small thickets, and feeds on fruits, roots, and insects. It is fond of raw or roasted flesh, and

devours cockroaches in large numbers when kept in houses. It hibernates in winter. The female bears four to eight young at a birth, the young soon becoming covered with prickles. It is found in Britain and in most parts of Europe. Other species are found in Asia and Africa.

Hedge Warbler (or Hedge Sparrow), a bird common in the British Islands and all the temperate parts of Europe. It feeds on insects, worms, and seeds; and its nest, built of green moss, roots, and wool, and lined with hair, is generally finished early in March. The eggs, four or five in number, are bluish green. The cuckoo often deposits her egg in the hedge warbler's nest. The plumage is generally of a reddish brown, streaked with dark brown. The song of the male is short and plaintive. The length of the bird is about 5½ in.

Hegel (hā′gl), Georg Wilhelm Friedrich (1770–1831), a celebrated German metaphysician, b. at Stuttgart. Having removed to Jena, and contracted an intimacy with Schelling, he devoted himself to metaphysical study. After the battle of Jena, Hegel was employed on a newspaper at Bamberg until 1808, when he became successively rector of Nürnberg Gymnasium, professor of philosophy at Heidelberg (1816), and at Berlin from 1818 to his decease in 1831. Among his works the most important are his *Phänomenologie des Geistes* (1807), *Wissenschaft der Logik* (1812–16), *Encyclopädie der philosophischen Wissenschaften* (1817), and *Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft* (1821). He asserts that if the order and connection of our thoughts is involved in the order and connection of things, the universal form in the course of objective action must exactly agree with the form of the development of our thoughts, and *vice versa.* As there are, according to him, three stages in the process of thought and existence, his system has necessarily a threefold division: logic; the philosophy of nature; and mental philosophy. Hegelianism has been more influential in the direction of the philosophy of religion than in any other department; but it is divided into three camps, representing respectively the supernatural, the rational, and the mystical.

Hegira (Hejra or Hijra) (an Arab word which means "going away"), the term commonly used to indicate Mohammed's flight from Mecca, Sept. 13, 622 A. D. In 639 or 640 the Caliph Omar instituted a new Moslem calendar, to begin with the first day of the first month in which the flight took place. The Mohammedan year, as a lunar year, is shorter than ours by 10 days, 21 hours, and 14⅗ seconds. A rough and ready method for finding the year in our calendar corresponding to a given year in the Mohammedan is to subtract from the latter $\frac{1}{33}$ of itself and add 622 to the remainder. To find the precise year and day, multiply the year of the Hegira by 970,224, strike off from the product six decimal figures, and then add 621.5774; this will give the year of the Christian era: and the day of the year is got by multiplying the decimal figures by 365.

Heidelberg (hī′dl-ber*h*), a town of Baden, sit-

uated on the left bank of the Neckar, in one of the loveliest districts of Germany. It stands on a narrow strip between the river and the castle-rock and Geisberg, spurs of the Königstuhl (1,850 ft.); and chiefly consists of one main street and less important cross and parallel streets. The castle, begun in the end of the thirteenth century, and exhibiting elaborate examples of early and late Renaissance architecture, is the most remarkable edifice in Heidelberg. It is now an ivy-clad ruin, but is carefully preserved from further decay. The principal industry is brewing. One of the greatest curiosities of the place is the Heidelberg tun, kept in a cellar under the castle. It is 36 ft. in length, 26 in diameter, and capable of holding 800 hogsheads. Pop. 31,739.

Heights, MEASUREMENT OF (or Hypsometry), is that department of geodesy which treats of the measurements of the absolute or relative heights of various points on the earth's surface. In all cases in which great accuracy is essential, trigonometrical method must be employed, but in other cases sufficiently accurate results may be obtained by leveling, by the use of the barometer, or by the boiling point of water as given by the thermometer. The trigonometrical method is often the only one available, as the height to be measured may be quite inaccessible. The barometric method is based on the fact that as the mercurial column is supported by the atmospheric pressure it must fall when conveyed from a lower to a higher level, as in the latter case the pressure is diminished.

Heilbronn, a town of Würtemberg, situated on the Neckar, quite a mediæval place in the older parts, but having modern suburbs. Heilbronn was long an imperial free town. Pop. 28,038.

Heimdall, a divinity in the Scandivanian mythology, who keeps watch on the bridge Bifröst, which connects the domain of the Æsir, or gods, with that of men. His sight and hearing are more acute than those of mortals, and nothing can evade his vigilance.

Heine (hī′nė), HEINRICH (1779–1856), a German poet and author, was b. of Jewish parents at Düsseldorf. He studied law at Bonn, Berlin, and Göttingen; took his degree at the last-mentioned place, and in 1825 embraced Christianity. He afterward lived at Hamburg, Berlin, and Munich, but in 1830 he settled in Paris, supported himself by his literary labors, and dwelt there until his death. From 1837 to the overthrow of Louis Philippe in 1848, he enjoyed a pension of 4,800 francs from the French government. Of the numerous literary works of Heine may be mentioned in particular, *Gedichte* (*Poems*); *Reisebilder* (*Pictures of Travel*); *Buch der Lieder* (*Book of Songs*); *Die Romantische Schule; Letzte Gedichte und Gedanken* (*Last Poems and Thoughts*). As a poet Heine is remarkable for the simplicity and pathos of many of his lyric pieces. His powers of wit and raillery were also great, but he often transgressed the bounds of propriety and decorum. Scepticism and over-sensuousness are prominent characteristics.

Heirloom, in law, means some personal chattel which goes by special custom to the heir-at-law, together with the inheritance. The term is often applied to the case where certain chattels, such as pictures, etc., are directed by will to follow along with the estate.

Hel, the Norse goddess of the dead, who dwells beneath one of the three roots of the ash Yggdrasil; daughter of Loki. Dark rivers surround her abode; a dog watches without; the horse she rides has three feet; she herself is half black and half of fair complexion.

Helder, THE, a fortified seaport of Holland, in the most northern part of the province of North Holland, opposite the island of Texel, and commanding the entrance to the Zuyder Zee. From a fishing town Napoleon converted it to a fortress and naval station of the first rank, and called it his northern Gibraltar. Being much exposed, the port and coasts are protected by gigantic dikes, one 6 mi. long and built entirely of Norwegian granite. Pop. 21,545.

Helen (or Hel′ena), in ancient Greek legend, the most beautiful woman of her age, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterward carried off to Troy by Paris, the Trojan War arising from the claim made by Menelaus for the fulfillment of the oath. After the death of Paris she married his brother Deiphobus. On the fall of Troy she returned to Sparta with Menelaus, but was murdered at Rhodes.

Helena, Phillips co., Ark., on Mississippi River. Railroads: St. L. I. M. & S.; Y. & M. V.; and Arkansas Midland. Industries: oil mills, lumber cos., box, shingle, and other factories. Surrounding country agricultural. Pop. 1900, 5,550.

Helena, Lewis and Clarke co., Mont. Railroads: Great Northern (Montana Central); Northern Pacific, main line; Helena & Red Mountain; and Helena & Boulder Valley. Industries: Flouring mills, three iron foundries, and other factories. Surrounding country agricultural and mineral. Situated on the site of Last Chance Gulch; U. S. assay office and Ft. Harrison post located here. The town was first settled in 1864. Pop. 1900, 10,770.

Hęle′na, ST., an island in the South Atlantic, belonging to Britain; area 47 sq. mi. Its position in the ocean thoroughfare from Europe to the East, has made it a place of call for vessels, while it has acquired special celebrity as the place of Napoleon's banishment, and where he resided from 1816 till his death in 1821. Properly speaking, there are neither manufactures nor trade. About one fifth of the entire surface is available for cultivation, while the uplands feed large numbers of goats. Pop. 5,085.

Hel′enus a Trojan soothsayer, son of Priam and Hecuba, twin brother of Cassandra, and husband of Andromache after Hector's death. He foretold the destiny of Æneas.

Hel'icon (now *Sagara*), a mountain range of Greece, in the west of Bœotia, in some sense a continuation of the range of Parnassus. It was the favorite seat of the Muses, who, with Apollo, had temples here. In it also were the fountains of Aganippe and Hippocrene. The highest summit, now called *Paleovuni*, is barely 5,000 ft. high.

Helier, St. the capital of the island of Jersey, on the south coast, on the east side of St. Aubin's Bay. The mild climate and cheapness of living make it a favorite place of residence and summer resort. It is the seat of the states, or representative Parliament of Jersey, and the terminus of two small railways. Pop. 27,990.

Heliogab'alus (or Elagabalus) (205–222), a Roman emperor, son of Sextus Varius Marcellus. He received his name from having been, while still a child, priest of Elagabalus, the Syro-Phœnician sun god. After the death of Macrinus he was invested, at the age of fourteen, with the imperial purple, but his licentiousness soon displeased the populace, and he was slain in an insurrection of the prætorians, after a reign of less than four years.

Heligoland (Danish *Helgoland*—Holy Land), an island belonging to Germany, in the North Sea, about 40 mi. from the mouth of the Elbe; 1¼ mi. long and ½ mi. broad; highest point, 200 ft. Its rocks, of reddish sandstone, present a perpendicular face to the sea, but are being rapidly eaten away by the waves. The island produces potatoes, barley, and oats, but oysters and lobsters are the chief products. The town consists of about 400 houses, and is much resorted to for sea-bathing. The inhabitants, of Frisian descent, are mainly fishers, pilots, and lodging-house keepers. Heligoland was captured by Britain from Denmark in 1807, conceded to Germany in 1890. Pop. 2,003.

He'liograph (or Heliostat), a name given to various contrivances for reflecting the sun's light either temporarily or continuously to an observer at a distance. The simplest heliostat is a mirror hung up at a distant station so as to reflect a flash to the observer whose station may be many miles from it. This mirror is generally so adjusted that the flash occurs exactly at some prearranged hour, and by being in readiness the observer can get an observation with precision as regards time. Some heliostats are visible for 80 mi. By being fitted with an adjustment of clock work, the mirror can be made to revolve with the sun, and so to reflect a beam of sunlight steadily in one direction, being then called also *heliotrope*. The heliostat has been used for signaling in war.

Heliogravure (or Photogravure), is a photomechanical printing process. A photograph of any object, as a painting, etc., is taken, and from the negative so obtained a positive print is made on gelatinized paper. This print is transferred upon a highly polished copper plate, and a solution of terchloride of iron is poured upon it. The iron penetrates through the gelatine and etches the picture upon the copper. The final result is the production of a photo-etched copper-plate, from which a large number of impressions can be taken.

Heliop'olis (City of the Sun), the On, Rameses, or Beth-shemesh of the Hebrew Scriptures; now called Matarich; situated a little n. of Memphis, and one of the most ancient and extensive cities of Egypt under the Pharaohs. It had a magnificent temple dedicated to Re; and communicated with the Nile by lakes and canals. During the flourishing ages of the Egyptian monarchy the priests taught within the precincts of its temples, and both Eudoxus and Plato visited its famous schools. Here Joseph and Mary are said to have rested with the infant Christ. Near the village stands the Pillar of On, supposed to be the oldest Egyptian obelisk, 67½ ft. high, and 6 ft. broad at base. The Turks were defeated here by the French in 1800.

He'lios, the god of the sun (Latin, *Sol*) in the Greek mythology; son of Hyperion and Theia, and brother of Eos (Aurora, the dawn) and Selēnē (Luna, the moon). He dwells with Eos in the ocean behind Colchis, from which he issues in the morning, and to which he returns at night. His worship was extensively diffused, and he had temples in Corinth, Argos, Trœzene, Elis, but particularly in Rhodes, the Colossus of which was a representation of Helios.

He'lioscope, a telescope fitted for viewing the sun without distressing the eyes, as when the image of the sun is received upon mirrors formed simply of surfaces of transparent glass which reflect only a small portion of the light.

He'liotrope, a genus of plants. The species are herbs or undershrubs, mostly natives of the warmer parts of the world. The common

Common Heliotrope.

heliotrope is indigenous in the south and west of Europe, and has small white or pale red flowers with a fruit of four drupes under a thin fleshy covering. The *H. peruvianum* is a very fragrant garden plant, growing to about 2 ft. in height and bearing small lilac-blue flowers.

Heliotrope, the bloodstone, a variety of quartz, partaking of the character of jasper or of chalcedony. It is of a deep green color, and covered with red spots. It is hard, and is used for burnishers; the more finely-marked stones are prized for seals, signet-rings, etc. It is found in Tartary, Persia, Siberia, in the island of Rum, Scotland, and elsewhere. It received the name heliotrope, or elitropia, because it was said that if the mineral were put into water in a basin rubbed with the juice of the plant heliotrope, and were exposed to the sun, the water would appear red and the sun blood-like, as if it was eclipsed. The stone rubbed with the juice of the plant was said to render its wearer invisible.

He'liotype, a photographic process by which pictures can be printed in the same manner as lithographs, depending on the fact that a dried film of gelatin and bichromate of potash, when exposed to light, is afterward insoluble in water, while the portion not so exposed swells when steeped. A mixture of gelatin, bichromate of potash, chrome alum, and water is poured on a plate of glass, where it shortly settles into a film. When dried the film contracts and separates from the glass. A picture is then printed on it from a negative, after which it is attached to a plate of zinc, and copies are taken from it by inking it with lithographic ink exactly as in the ordinary lithographic process. The films are technically called "skins." Sometimes a gutta-percha mold is prepared from the film, and copper deposited on it by the electrotype process, the plate thus produced being printed from in the ordinary way.

Helium, the name given to a chemical element formerly supposed to exist only in the sun but which has recently been separated from various minerals such as cleveite, broggerite, and samarskite. It has a characteristic spectrum which differs in different samples showing that, probably, the gas is a mixture. Next to hydrogen, helium is the lightest known gas, and does not seem to enter into chemical combination.

Hell (A. Saxon, *hel*, from *helan*, to cover), signifies originally the covered or invisible place. In the English Bible the word is used to translate the Hebrew *sheol* (grave or pit) and *Gehenna* (properly, the valley of *Hinnom*), as well as the Greek *Hades* (the unseen). In the Revised Version of the New Testament, however, hell is used only to translate *Gehenna*, *Hades* being left where it stands in the Greek. In common usage hell signifies the place of punishment of the wicked after death, its earlier meaning being lost. The distinctive Scripture term for the place of future punishment of the wicked is Gehenna, which, unlike Sheol and Hades, never has an intermediate signification; and Christ, adopting on this point the current language of the time, gave the sanction of his authority to the leading ideas involved in it. Gehenna, or hell, is with him the place of final torment. The Eastern and Western churches are at one as to the punishment of hell being partly "a pain of loss," that is, the consciousness of being debarred the presence of God, and partly a "pain of sense," that is, real physical suffering. The prevailing idea among modern theologians is that the "fire" and the "worm" are significant emblems to give us the most correct and living conceptions of the reality that we can possibly attain in our present circumstances.

Hellas, Hellenes. See *Greece.*

Hel'lebore, a genus of plants, consisting of perennial low growing plants with leathery leaves, yellowish, greenish, or white flowers, having five conspicuous persistent sepals, eight to ten small tubular petals, and several many-seeded carpels. *H. orientālis* is the species which produce the black hellebore of the ancients. The Christmas rose common in gardens, is a native of South and East Europe, and is the source of the black hellebore of modern pharmacopeias.

Christmas Rose.

Hell Gate, a formerly dangerous pass in East River, the strait which connects New York Bay with Long Island Sound. Rocks here used to form an obstruction much dreaded by mariners, but by extensive submarine mining operations and the use of the most powerful explosives, the passage has been practically cleared.

Helmet, an article of armor for the protection of the head, composed of leather or of metals. Some of Homer's heroes are represented as wearing brazen helmets with towering crests. Among the Romans the *cassis* was a metallic helmet; the *galea*, a leathern one. The earlier Greek and Roman helmets did not protect the face. During the Middle Ages helmets were made of steel, frequently inlaid with gold, and provided with bars and flaps to cover the face in battle and to allow of being opened at other times. The full-barred helmet entirely covered the head, face, and neck, having in front perforations for the admission of air, and slits through which the wearer might see the objects around him. The open helmet

covered only the head, ears, and neck, leaving the face unguarded. Some open helmets had a bar or bars from the forehead to the chin, to guard against the transverse cut of a broadsword. The modern military helmets afford no protection for the face. Firemen wear a heavy headpiece of leather and brass, or other materials, to protect them as far as possible from falling ruins at conflagrations. Helmets of white felt, with folds of linen wrapped round them, are worn in India and other hot climates as a protection against the sun. The name helmet is also given to a kind of hat worn by policemen.

Helmholtz, HERMANN LUDWIG FERDINAND (1821–1894), German physiologist and physicist, b. at Potsdam, and educated at Berlin. In 1848 he became professor of anatomy at the academy of fine arts, Berlin, and in 1849 he obtained the chair of physiology at Königsberg, from which he was successively transferred to the same post at Bonn (1855) and at Heidelberg (1858). In 1871 he was appointed professor of physics at Berlin. His work has been chiefly in those departments of physics which are in closest relation with physiology, notably in acoustics and optics. Of his many publications the best known are: *The Conservation of Force* (1847), *Manual of Optics* (1856–66), *Popular Lectures on Scientific Subjects* (London, 1873 and 1881), and *Sensations of Tone as a Physiological Basis for the History of Music* (1862, London, 1875). He was ennobled by the German emperor in 1883.

Helmund, a river in Afghanistan, which it traverses diagonally northeast to southwest, and ultimately falls into the extensive Lake Hamoon, after a course of about 550 mi. Its source is 1,500 feet above sea level.

Heloder'ma, a Mexican genus of lizards, of which one species at least, the Gila monster, is suspected to be venomous, all its teeth being furnished with poison glands. It is about 3 ft. in length, has a thick and squat body covered with rough scales, forms burrows under the roots of trees, is nocturnal in habit, and is said to feed on insects, worms, millepeds, etc.

Heloise (Eloise) (el-o-ēz) (1101–1164), celebrated for her beauty and wit, but still more on account of her love for Abelard. After the mutilation of her lover she was persuaded by him to take the veil at Argenteuil, and ultimately became prioress of the convent there until 1129, when she entered, with some of her nuns, the oratory of the Paraclete, built by Abelard at Nogent-on-the-Seine, where she lived in exemplary piety. Contemporary writers speak in high terms of her genius. She understood Latin, Greek, Hebrew, was familiar with the ancients, and well read in philosophy and theology.

He'lots, slaves in ancient Sparta. They were the property of the state, which alone had the disposal of their life and freedom, and which assigned them to certain citizens, by whom they were employed in private labors. Agriculture and all mechanical arts at Sparta were in their hands, and they were also obliged to bear arms for the state in case of necessity.

They behaved with great bravery in the Peloponnesian War, and were rewarded with liberty (431 B. C.), but 2,000 appear to have been subsequently massacred. They several times rose secretly against their masters, but were always and finally reduced.

Helsingborg, a seaport in Sweden, opposite Elsinore. It has manufactures of leather, dyeworks, tile works, salt works, and a spacious harbor. Pop. 20,897.

Helsingfors, a seaport of Russia, capital of Finland, 180 mi. w.n.w. St. Petersburg. It has manufactures of linen, sail cloth, and tobacco, an important trade in timber, corn and fish, and one of the best harbors in the Baltic. Pop. 61,583.

Helve'tii, anciently a Gellic or Celtic nation, dwelling in the country now nearly corresponding with Switzerland. They were not much known to the Romans until the time of Julius Cæsar, who, as governor of Gaul, prevented their intended emigration, and after many bloody battles pressed them back within their frontiers. After their subjection by Cæsar several Roman colonies were established among them. On the death of Nero the Helvetii, for refusing to acknowledge Vitellius as emperor, were mercilessly punished by Cæcina, one of his generals, and thenceforth almost disappear as a people.

He'mans, FELICIA DOROTHEA (1794–1835), English poetess, b. at Liverpool. She first appeared as an authoress in 1808, with a volume entitled *Early Blossoms*, which was followed in 1812 by her more successful volume, *The Domestic Affections*. Her poetry is essentially lyrical and descriptive, and is always sweet, natural, and pleasing.

Hema'tine (or Hæmatine), the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hem'atite, a name applied to two ores of iron, red hematite and brown hematite. They are both of a fibrous structure, and the fibers, though sometimes nearly parallel, usually diverge or even radiate from a center. They rarely occur amorphous, but almost always in concretions, reniform, globular, botryoidal, stalactitic, etc. The red hematite is a variety of the red oxide, and is one of the most important iron ores. The brown hematite is a variety of the brown oxide or hydrate; its streak and powder are always of a brownish yellow.

Hemio'pia, a defect of vision in which the patient sees only a part of the object he looks at, the middle of it, its circumference, or its upper or lower part, or more commonly one lateral half, being completely obscured.

Hem'isphere, half a sphere, especially one of the halves into which the earth may be supposed to be divided. It is common to speak of the Eastern Hemisphere and the Western Hemisphere, the former, also called the Old World, comprising Europe, Asia, Africa, Australia, etc.; the latter, North and South America, etc. The boundary between the two is quite arbitrary, and a more natural division of the earth

is into the northern and the southern hemisphere, the equator forming the dividing line.

Hemlock, a poisonous plant, supposed to be identical with the plant *kōneion* of the Greeks. It is a tall, erect branching biennial, with a smooth, shining, hollow stem, usually marked with purplish spots, elegant, much-divided leaves, which when bruised emit a nauseous odor, and white flowers in compound umbels of ten or more rays, surrounded by a general involucre of three to seven leaflets. It is found in Britain and throughout Europe and temperate Asia in waste places, banks, and under walls. It is said to be fatal to cows when they eat it, but that horses, goats, and sheep may feed upon it without danger. In the human subject it causes paralysis, convulsions, and death. The poison administered to Socrates is supposed to have been a decoction of it, though others are of opinion that the potion was obtained from water-hemlock. Hemlock is a powerful sedative, and is used medicinally. The extract is considered the best preparation. It is often serviceable as a substitute for or an accompaniment to opium. It has been found very useful in chronic rheumatism and in whooping-cough, in allaying the pain of irritable sores and cancerous ulcers. The hemlock is a common plant in the U. S.

Flowers and Root of Common Hemlock.
c.—flower; *d.*—seed.

Hemp, a plant. It is a native of Western and Central Asia, but has long been naturalized in Brazil and tropical Africa, and is extensively cultivated in Italy and many other European countries, particularly Russia and Poland. The Indian variety is the source of the narcotic drug variously known as *hashish*, *bhang*, or *gunjah*. The hemp fiber is tough and strong, and peculiarly adapted for weaving into coarse fabrics such as sail cloth, and for twisting ropes and cables. Immense quantities are exported from Russia. The finer sorts are used for shirtings, sheetings, etc., which, though coarser than that made from flax, are very much stronger and equally susceptible of being bleached. The hemp of England is very superior, but the plant does not pay the farmer, and very little of it is grown. In some of the states it is a crop of

considerable importance. The seed must be sown thin, not more than 1 to 2 bushels to an acre. Small paths are often left open along the field lengthwise, at about 7 ft. distant from each other, to allow the plucking of the male plants first, as the female require to remain standing a month longer to admit of the seed becoming ripe. But in some parts the whole crop is cut at once, plants for seed being separately cultivated. The plant being stripped of its leaves, and dried in the open air, may be stored, but when steeped green it turns out of a better color. The steeping takes from four to eleven days, and the operation is known to be completed by the inner *reed* or

Common Hemp; female plant.

Common Hemp.

woody fiber separating easily from the fibers of the outer bark. When thoroughly steeped it is taken out of the water and spread out in rows on the grass to bleach. This takes three weeks or more, during which period it requires constant turning with a light, long pole. After drying it is scutched or broken by breaks and scutching stocks, resembling those employed for flax. Beating is the next operation, which separates the "boon" from the fiber. The hemp is now ready for being heckled, after which it may be spun. Hemp seed is much used as food for cage birds, and also yields an oil. Sisal hemp (or henequen) and Manilla hemp are not true hemps.

Hemp Palm, a Chinese and Japanese species of palm, of the fibers of whose leaves cordage is made, while hats and even cloaks are made from the leaves themselves.

Hems (or Homs) (Roman, *Emesa*), a town of Syria, 85 to 90 mi. n.e. of Damascus. It is fortified, and has an active trade. Pop. 30,000.

Henderson, Henderson co., Ky., on Ohio River. Railroads: L. & N.; O. V.; and L. H. & St. L. Industries: cotton mill, two flouring mills, iron foundry, woolen mill. Surrounding country agricultural. Pop. 1900, 10,272.

Hendricks, THOMAS A. (1819–1885), vice-president of the U. S., was b. in Ohio. He served in the Indiana legislature and in both houses of Congress. As U. S. senator he was pronounced in favor of the Union. In 1872 was elected governor of Indiana. In 1876 and 1884 was candidate for the vice-presidency, being elected in the latter year.

Hengist, a prince of the Jutes, founder of the kingdom of Kent in Great Britain, in conjunction with his brother Horsa. In 449 the Britons sued for aid from the Saxons against the inroads of the Scots and Picts. The Saxons under Hengist and Horsa accordingly landed at the mouth of the Thames, and defeated the northern tribes near Stamford in 450 A. D.

Henley on Thames, a municipal borough of England, in Oxfordshire, on the left bank of the Thames, here crossed by a handsome bridge, 35 mi. w. of London. Henley is famous for the regattas held there each summer. Pop. 4,603.

Henna, a shrub bearing opposite entire leaves and numerous small white fragrant flowers. Externally it bears considerable resemblance to the European privet. It grows in moist situations throughout North Africa, Arabia, Persia, and the East Indies, and has acquired celebrity from being used by the inhabitants of those countries to dye yellow the nails of their fingers and the manes, hoofs, etc., of their horses. It is cultivated extensively in Egypt, and the powdered leaves form a large article of export to Persia and the Turkish possessions. It may be used for dyeing woolens, not only yellow, but brown, when alum and sulphate of iron are employed.

Henrietta Maria (1609–1669), queen of Charles I of England; youngest child of Henry IV of France, by his second wife Maria de' Medici. The proposed marriage between

Charles, Prince of Wales, and the Infanta of Spain having failed, a matrimonial negotiation was opened with Henrietta, whom he had first met at a ball in Paris while on his way to Spain. The marriage was celebrated by proxy at Paris in 1625, but her first popularity in England was soon destroyed by her bigotry, hauteur, and despotic ideas as to divine right. Much of the subsequent procedure which brought Charles to the block may be traced indirectly to her influence. On the breaking out of civil war she proceeded to Holland, procured money and troops, and afterward joined Charles at Oxford. She again went to the Continent in 1644, and resided in France till the Restoration. On that occasion she visited England, but soon returned to France, and died near Paris.

Henry, a frequent name of medieval European kings. In addition to the kings of England may be mentioned the following kings of Germany, Henry I (876–936); Henry II (972–1024); Henry III (1017–1025); Henry IV (1050–1106); Henry V (1081–1125); Henry VI (1165–1197); Henry VII (1262–1313). Of France besides Henry of Navarre (see *Henry IV, post*) there were Henry II (1519–1559) and Henry III (1551–1589).

Henry IV of France (1553–1610), better known as Henry of Navarre; the son of Anthony of Bourbon, duke of Vendôme, and of Jeanne d'Albret, daughter of Henry, king of Navarre, and herself afterward queen of Navarre. He was b. at Pau. Educated by his mother in the Calvinistic faith, he early joined, at her wish, the Protestant army of France, and served under Admiral Coligny. In 1572 he married Margaret of Valois, sister of Charles IX, and after the massacre of St. Bartholomew, which took place during the marriage festivities, was forced to adopt the Catholic creed. In 1576 he escaped from Paris, retracted at Tours his enforced abjuration of Calvinism, put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. On becoming presumptive heir to the crown in 1584 he was obliged to resort to arms to assert his claims. In 1587 he defeated the army of the League at Coutras, and after the death of Henry III gained the battles of Arques (1589) and Ivry (1590). He was obliged, however, to raise the siege of Paris; and convinced that a peaceful occupation of the throne was impossible without his professing the Catholic faith, he became nominally a Catholic in 1593. After his formal coronation in 1594 only three provinces held out against him—Burgundy, reduced by the victory of Fontaine-Francaise in 1595; Picardy, reduced by the capture of Amiens in 1596; and Brittany, which came into his hands by the submission of the Duke of Mercœur in the spring of 1598. The war against Spain was concluded in 1598 by the Peace of Vervins to the advantage of France. The same year was signalized by the granting of the edict of Nantes, which secured to the Protestants entire religious liberty. He made use of the tranquillity which followed to restore the

internal prosperity of his kingdom, and particulary the wasted finances, in which he was successful with the aid of his prime-minister Sully. At the instance of Sully, Henry divorced Margaret of Valois, and in 1600 married Maria de Medici, niece of the Grand-duke of Tuscany, mother of Louis XIII. She was crowned at St. Denis in 1610, but on the following day Henry was stabbed by a fanatic named Ravaillac, while examining the preparations for the queen's entry into Paris. The great benefits which Henry IV bestowed upon France entitle him to the designation which he himself assumed at an assembly of the Notables at Rouen in 1596, the Regenerator of France (*Restaurateur de la France*).

Henry I, king of England (1068–1135), surnamed *Beauclerc* ("fine scholar"), youngest son of William the Conqueror, was b. at Selby in Yorkshire. He was hunting with William Rufus when that prince was killed, in 1100, and instantly riding to London, caused himself to be proclaimed king, to the prejudice of his elder brother Robert, then absent as a Crusader. He re-established by charter the laws of Edward the Confessor, recalled Anselm to the primacy, and married Matilda, daughter of Malcolm III of Scotland, thus conciliating in turn the people, the church, and the Scots. Robert landed an army, but was pacified with a pension, and the promise of succession in event of his brother's decease. Soon after, however, Henry invaded Normandy, took Robert prisoner in 1106, and reduced the duchy. He was successful also in the struggle with France. The last years of his reign were very troubled. In 1120, his only son, William, was drowned, in returning from Normandy, where, three years later, a revolt occurred in favor of Robert's son. The Welsh also were a source of disturbance. Henry appointed as his heir his daughter Matilda, or Maud, whom he had married first to the emperor Henry V, and then to Geoffrey Plantagenet of Anjou. Henry d. at Rouen, and was succeeded by Stephen.

Henry II, king of England (1133–1189), first of the Plantagenet line, b. in Normandy, was son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I. The commencement of his reign was marked by the dismissal of the foreign mercenaries; and although involved with his brother Geoffrey, who attempted to seize Anjou and Maine, and in a temporary dispute with France, he reigned prosperously till the contest with Thomas à Becket regarding the Constitutions of Clarendon. Although sufficiently submissive after Becket's death in the way of penance and expiation, Henry only gave up the article in the Constitutions of Clarendon which forbade appeals to the court of Rome in ecclesiastical cases. He ranks among the greatest English kings both in soldiership and statecraft. He partitioned England into four judiciary districts, and appointed itinerant justices to make regular excursions through them; revived trial by jury, discouraged that by combat, and demolished all the newly erected castles as "dens of thieves."

Henry III (1207–1272), king of England; son of John by Isabel of Angoulême; b. at Winchester, succeeded his father in 1216. As Henry approached to manhood he displayed a character wholly unfit for his station, and after a reign characterized by dissension was succeeded by his son, Edward I.

Henry IV, king of England, first king of the house of Lancaster (1366–1413); was eldest son of John of Gaunt, duke of Lancaster, third son of Henry III, by the heiress of Edmund, earl of Lancaster, second son of Henry III. He ascended the throne in 1399. The first six years of his reign was a series of insurrections, which were finally quelled by Prince John. The rest of this king's reign was comparatively untroubled. In 1405 James, son and heir to King Robert of Scotland, was captured at sea on his way to France, and was detained a prisoner in England. Henry was succeeded by Henry V.

Henry V, king of England (1388–1422). On succeeding his father, Henry IV, in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. The struggle in France between the factions of the dukes of Orleans and Burgundy afforded Henry a tempting opportunity for reviving the claims of his predecessors to the French crown. He accordingly landed near Harfleur in August, 1415, and though its capture cost him more than half his army, he decided to return to England by way of Calais. A large French army endeavored to intercept him at the plain of Agincourt, but was completely routed (October, 1415). He returned in triumph to England, but on the defeat of his brother, the Duke of Clarence, in Normandy by the Earl of Buchan, he again set out for France, drove back the army of the dauphin, and entered Paris. A son was at this time born to him, and all his great projects seemed about to be realized, when he died of fever at Vincennes, at the age of thirty-four, and in the tenth year of his reign. He was succeeded by his son Henry VI.

Henry VI, king of England (1421–1471), b. at Windsor, was crowned at Westminster in 1429, at Paris in 1430. As he was an infant not nine months old at the death of his father Henry V, his uncle John, duke of Bedford, was appointed regent of France; and his uncle Humphrey, duke of Gloucester, made protector of the realm of England. A few weeks after Henry's succession Charles VI of France died, when, in accordance with the Treaty of Troyes, Henry was proclaimed king of France. The war which followed at first proved favorable to the English, but in the end, by the heroism of Joan of Arc, the death of the duke of Bedford, and the defection of the duke of Burgundy, resulted in the loss to the English of all their possessions in France except Calais. In April, 1445, Henry married Margaret of Anjou, daughter of René of Provence. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose best reputation is that of founder of Eton College and King's College, Cambridge.

Henry VII, king of England (1456–1509),

first sovereign of the race of Tudor. The reign of Henry VII was troubled by repeated insurrections, of which the chief were headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487), and Perkin Warbeck (1496–1499). His reign, however, was in the main beneficent. Its freedom from wars permitted the development of the internal resources of the country. His policy of depressing the feudal nobility, which proportionably exalted the middle ranks, was highly salutary. For a time, however, the power lost by the aristocracy gave an undue preponderance to that of the crown.

Henry VIII, king of England (1491–1547), son of the preceding, succeeded his father in 1509. After the election of Charles V to the German Empire both Charles and the French king, Francis I, sought the alliance of England. A friendly meeting took place between Henry and Francis at the Field of the Cloth of Gold (1520), but the interest of Charles preponderated. Now came the determination of the king to divorce his wife Catharine, who was older than he, had borne him no male heir, and had, moreover, been in the first place the wife of his elder brother. The last of these points was the alleged ground for seeking divorce, though Henry was probably influenced largely by his attachment to Anne Boleyn, one of the queen's maids of honor. Henry, in disgust, eagerly caught at the advice of Thomas Cranmer, afterward archbishop of Canterbury, to refer the case to the universities, from which he soon got the decision that he desired. In 1533 his marriage with Catharine was declared null, and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the pope, two acts of Parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535, declaring Henry the supreme head of the church. He suppressed the monasteries by act of Parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavorable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward, in 1537, fulfilled his wish for a male heir. The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves, the negotiations of which were conducted by Cromwell. The king's dislike to his wife, which resulted in another divorce, became extended to the minister who had proprosed the union, and Cromwell's disgrace and death soon followed. A marriage with Catharine Howard, in 1541, proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catharine Parr, a lady secretly inclined to the Reformation, who survived the king. In the meantime Scotland and France had renewed their alliance, and England became again involved in war. James V ravaged the borders, but was defeated at Solway Moss in 1542, and in 1544 Boulogne was captured, Henry having again allied himself with Charles V. Charles,

however, soon withdrew, and Henry maintained the war alone until 1546. Disease now so much aggravated the natural violence of Henry that his oldest friends fell victims to his tyranny. The duke of Norfolk was committed to the Tower, and his son, the earl of Surrey, was executed. Henry was succeeded by his son, Edward VI.

Henry, Joseph (1799–1878), physicist. In 1826 he began a series of brilliant experiments in electricity. In 1830 he constructed the first electro-magnetic telegraph, which as a sounding telegraph has never been improved. In 1832 he was called to fill the chair of natural philosophy at Princeton. In 1846 he was elected secretary and director of the Smithsonian Institution. His published papers include over 150 titles.

Henry, Patrick (1736–1799), a great American orator and patriot, was b. in Hanover co., Va. His father was a native of Scotland, his grandmother a cousin of Robertson the historian. Henry received a share of classical education, but at an early age entered business, and married at eighteen. Having failed successively in "storekeeping" and in farming, he became a lawyer in 1760, and three years later found his opportunity, when, having been employed to plead the cause of the people against an unpopular tax, his great eloquence seemed suddenly to develop itself. This defense placed him at once in the front rank of American orators, and his later speeches advanced him to their head. From amid the sullen murmurs and remonstrances that the passage of the Stamp Act evoked, his voice it was that first rose in a clear, bold call to resistance. Throughout the war of independence he was a zealous patriot. He was a delegate to the First Continental Congress, which met at Philadelphia in 1774, and delivered the first speech in that assembly—a speech that for fiery eloquence and lofty tone was worthy of so momentous a meeting. In 1776 he carried the vote of the Virginia convention for independence; and in the same year he became governor of the new state. He was afterward four times re-elected. In 1791 he retired from public life, and returned to his practise; in 1795 he declined the secretaryship of state offered him by Washington. Henry was an able administrator, a wise and far-seeing legislator; but it is as their greatest orator that his memory lives in the minds of most Americans. No one who has come after has approached him in ability to stir and sway the passions of an audience.

Henry the Navigator (*Don Henrique el Navegador*) (1394–1458), fourth son of King John I of Portugal. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea; resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. In 1433 Gilianez, one of his navigators, safely doubled Cape Bojador, and other adventurers, pushing still further south, discovered Cape Blanco in 1441 and Cape Verd in 1445. A profitable commerce with the natives of West Africa was soon developed, and the Senegal and Gambia partially explored.

After acting as general against the Moors in 1458 Henry died at Sagres. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commercial enterprise.

Hep'tarchy, the seven principal kingdoms into which England was divided in Anglo-Saxon time. The kingdoms were founded at different times, and at no one time were they all independent monarchies together. In 827 King Egbert of Wessex united the other kingdoms into one, and assumed the title of king of England.

Hera, an ancient Greek goddess, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn) and Rhea. The poets represent Zeus as an unfaithful husband, and Hera as an obstinate and jealous wife, the result of which is frequent strife between them. She was worshiped in all Greece, but her principal seats were at Argos and at Samos. The companions of Hera were the Nymphs, Graces, and Hours. Iris was her particular servant. Among animals, the peacock, the goose, and the cuckoo were sacred to her. Her usual attribute is a royal diadem on her head. The festivals in her honor were called Heræa. The principal were those celebrated every fifth year at Argos, which city was considered to be especially under her protection.

Heracli'tus, a Greek philosopher, b. at Ephesus, who flourished about 513 B.C. He traveled in different countries, particularly in Africa. On his return to Ephesus he was offered the chief magistracy, but refused it. He is said to have latterly repaired to solitary mountains to live on roots and herbs; but, being attacked by a fatal disease, was obliged to return to the city, where he d. soon afterwards, it is said in his sixtieth year. He left a work on *Nature*, in which he treats also of religion and politics. Some fragments only of this work remain.

Heracli'us (575–641), Roman emperor of the East, b. in Cappadocia; the son of Heraclius, exarch of Africa. At the head of a fleet from Carthage, in 610, he assisted in dethroning Phocas, the murderer and successor of the emperor Mauritius, and himself ascended the throne. In a succession of splendid victories he crushed the Persians under Chosroes; but the energy of his earlier years seems to have worn itself out, and he made no effort to check the victorious progress of Mohammed. Before his death Syria, Palestine, Mesopotamia, and Egypt had fallen under the dominion of the caliphs. He was succeeded by his son, Constantine III.

Her'ald, an officer whose functions originally were to carry messages of courtesy or defiance between sovereigns or persons of knightly rank, to superintend and register the results of trial by battle, tournaments, and other chivalric exercises, to record the valiant deeds of combatants, proclaim war or peace, marshal processions and public ceremonials, and especially in later times to regulate and

determine all matters connected with the use of armorial bearings.

Her'aldry, the whole science of a herald's duties, or more commonly the knowledge of the forms, terms, and laws which pertain to the use of armorial bearings or coats of arms. Badges and emblems on shields, helms, banners, etc., naturally occurred in the earliest times, and the symbols were sometimes hereditary. The origin of heraldic arms, properly so called, is however, to be attributed to the necessity which arose during the Crusades of distinguishing the leaders of the numerous and motley bands of warriors which constituted the Christian armies. The rules of heraldry now practised at the Heralds' College are comparatively modern, and differ in some respects from those of other European courts. A coat of arms consists of the figure of a shield marked and colored in a vast variety of ways, so as to be distinctive of an individual, a family, or a community. The shield or *escutcheon* represents the original shield used in war, and on which arms were anciently borne. The surface of the escutcheon is termed the *field*, and the several parts or *points* of it have particular names, so that the figures which the field contains may be precisely located. In the accompanying illustration A B C marks the part of the shield called *the chief*, which is the highest and most honorable part of the shield. A is the *dexter chief* or upper *right hand* side of the shield; B, the *middle chief;* and C, the *sinister chief*, or upper *left hand* side of the shield; E, the *center* or *fesse point;* G H I, the *base*, that is, G, the *dexter* or right hand *base;* H, the *middle base;* and I, the *sinister* or left-hand *base.* Color is given in the coat of arms by means of *tinctures*, two of which are *metals—or* and *argent*, that is, gold and silver—the rest *colors* proper. These colors are in heraldic terminology, *azure*, blue; *gules*, red; *sable*, black; *vert*, green; *purpure*, purple; *tenney*, orange; *sanguine*, blood color. The two last are comparatively uncommon. An object represented in its natural colors is said to be *proper.* When not given in colors or by actual gilding the tinctures are represented by points and lines in black and white. *Or* is distinguished by small dots covering the part; *argent* is represented by leaving the space blank; *azure* is shown by horizontal lines; *gules*, by perpendicular lines; *sable*, by perpendicular and horizontal lines crossing each other; *vert*, by diagonal lines running from the dexter chief to the sinister base; *purpure*, by diagonal lines running from the *sinister* chief to the *dexter* base. Another class of tinctures are the *furs*, of which the two principal are *ermine* and *vair*, and which have also their special method of representation. The figures borne on the shield may be either purely artificial and conventional, or may represent real objects, animals, plants, etc. Of the former the most common are known as *ordinaries*, and have the following names: Chief, Pale, Bend, Bar, Chevron, Cross, and Saltire. The *chief* is a portion of the shield at the top marked off by a horizontal line, and covers the upper third

part of the field. The *pale* occupies the middle third part of the field perpendicularly. The *bend* is drawn diagonally from the dexter chief to the sinister base in the form of a belt, and also occupies the third of the field. A diminutive of the bend is the *bendlet*. The *bar* occupies only a fifth of the field, and is not confined to any particular part of it, except when there is only one bar, when it occupies the middle fifth of the field horizontally. Bars are mostly two in a field, sometimes three or more. A diminutive is the *barrulet*. The *chevron* may be regarded as made of a bend dexter and sinister issuing from the right and left base points of the escutcheon and meeting like two rafters. The *cross* is the ordinary cross of St. George. The shield is often divided by lines running similarly to the ordinaries; hence when divided by a perpendicular line it is said to be *party per pale*, when by a diagonal line *party per bend*. *Charges* are the figures of natural and artificial things, and include animals and plants, implements and objects of all sorts, and various imaginary monsters, being drawn either on the field or on one of the ordinaries. It is a rule in heraldry that metal must not be put on metal nor color on color; hence, if the field say is *argent*, it cannot have a charge or an ordinary tinctured *or* directly upon it. Various technical terms describe the position of animals; thus, a lion is *rampant* when he is erect standing on one of his hind legs; *sejant*, whensitting; *couchant*, when lying at rest, with the head erect; *passant*, in a walking position; *gardant*, looking full-faced; *rampant gardant*, erect and looking full-faced; *salient*, in a leaping posture. So *trippant* is said of the stag when trotting; *lodged*, of the stag when at rest on the ground; *volant*, of birds in general in a flying posture; *rising*, of a bird that is preparing to fly; *displayed*, of birds seen frontwise with outspread wings; *naiant*, of fishes when swimming; and so on. The teeth and claws of lions and other ravenous beasts are called their *arms;* and when these have a special tincture the animal is said to be *armed* of such a tincture; similarly if their tongue be of a special tincture, they are said to be *langued* of this tincture. Often two or more coats of arms are united together on one shield, so that the whole may be a very complicated affair. The art of arranging arms in this way is known as *marshaling*, and when the shield is divided up into squares for the reception of different coats it is said to be *quartered*.

Herat′, a city in the northwest of Afghanistan about 370 mi. w. of Cabul. The most important manufactures are carpets, sword blades, shoes, cloaks, and sheepskin caps. The trade, almost entirely in the hands of Hindus, is greatly favored by the situation of the town on the great thoroughfare from India westward. Herat was long the capital of the empire, founded by Tamerlane. Pop. about 45,000.

Hérault (ā-rō), a department of France, on

the Mediterranean coast; area 2,393 sq. mi. The vine and mulberry are extensively, the olive more partially cultivated; fruit is abundant; and aromatic, medicinal, and dye plants are largely grown. Salt is obtained in large quantities. Capital Montpellier. Pop. 441,527.

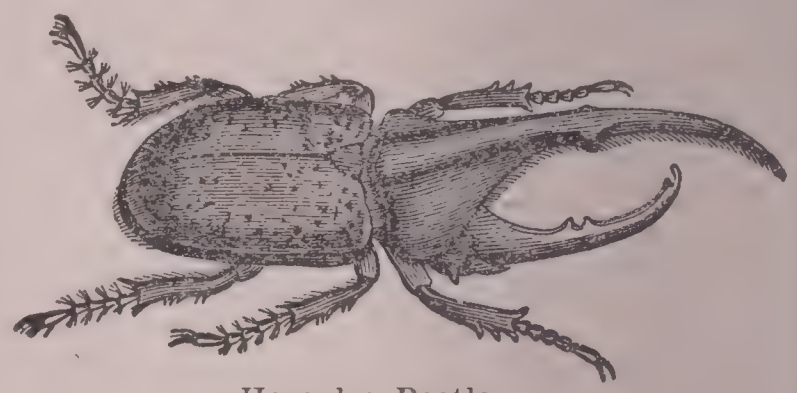
Herbert, Hilary A., b. in South Carolina in 1834. He was educated at the universities of Alabama and Virginia. He served in the Confederate army during the Civil War, and later resumed the practise of law. He was a member of the Forty-fifth, Forty-sixth, Forty-seventh, Forty-eighth, Forty-ninth, Fiftieth, and Fifty-first Congresses. He was appointed secretary of the navy by President Cleveland in 1893.

Hercula′neum, an ancient city about 5 mi. s.e. from Naples, completely buried with Pompeii, Stabiæ, etc., by lava and ashes during an eruption of Vesuvius in the reign of Titus, A.D. 79. The site had been long sought in vain, when in 1713 three statues were found in digging a well at the village of Portici. In 1738 the well was dug deeper, and traces of buildings were found. The knowledge of ancient art has gained more by the discoveries made here, than from literature.

Hercules, the most celebrated hero or semi-divine personage of Greek mythology, was the son of Zeus (Jupiter) by Alcmena, the wife of Amphitryon. He was brought up at Thebes, and before he had completed his eighth month strangled two snakes sent by the jealous Hera (Juno) to devour him. In youth he had several distinguished instructors, among them the Centaur Cheiron. Early in life he had, at the command of Zeus, to subject himself for twelve years to the will of Eurystheus, on the understanding that after he had acquitted himself of this duty he should be reckoned in the number of the gods. He therefore went to Mycenæ, and performed at the bidding of Eurystheus the tasks known as the *twelve labors of Hercules.* These were: 1, to kill a lion which ravaged the country near Mycenæ; 2, to destroy the Lernæan hydra; 3, to capture, alive and unhurt, a stag famous for its incredible swiftness, its golden horns, and brazen feet; 4, to capture alive a wild boar which ravaged the neighborhood of Erymanthus; 5, to clean the stables of Augeas, where 3,000 oxen had been confined for many years; 6, to kill the birds which ravaged the country near the lake Stymphalus, in Arcadia, and ate human flesh; 7, to bring alive into Peloponnesus a prodigious wild bull, which laid waste the Island of Crete; 8, to obtain the mares of Diomedes, which fed upon human flesh; 9, to obtain from the queen of the Amazons a girdle which she had received from Ares (Mars); 10, to kill the monster Geryon, king of Gades, and bring to Argos his numerous flocks, which fed upon human flesh; 11, to obtain apples from the garden of the Hesperides; 12, the last and most dangerous of all, to bring from the infernal regions the three-headed dog Cerberus. Besides these labors, he also achieved of his own accord others equally celebrated. Thus, he assisted the gods in their wars against the giants, and it was through him alone that Zeus obtained the victory. Having attempted to plunder the temple at Delphi, he became engaged in conflict with Apollo, and was punished by being sold to Omphălē, queen of Lydia, as a slave, who restored him to liberty and married him. Having latterly returned to Greece, he became the husband of Dejanira, who unwittingly brought about his death by giving him a tunic poisoned with the blood of the Centaur Nessus, which she innocently believed would retain for her Hercules's love. The poison took effect whenever the garment was put on, and as the distemper was incurable, Hercules placed himself on a burning pile on the top of Mount Œta, was received up into heaven, and being there reconciled to Hera, received her daughter Hebe in marriage.

Hercules, one of Ptolemy's northern constellations, including 113 stars. The point to which the sun, with its accompanying system of planets, is traveling at present is situated in this constellation, which includes some remarkable star groups and nebulæ.

Hercules Beetle, a very large Brazilian lamellicorn beetle. An enormous horn projects



Hercules Beetle.

from the head, and a smaller one from the thorax, and the beetle attains a length of 5 in.

Hered′ity, the transmission from parent to offspring of physical and intellectual characters. This has been at all times believed in, but it is only in recent times that the conviction has, in the hands of Darwin, Herbert Spencer, and Wallace, been methodized so as to embody an important zoological doctrine.

Hereford (he′re-ford), a city of England, capital of county of same name. The beautiful cathedral near the Wye was rebuilt, in the reign of William the Conqueror, on the site of an earlier edifice, and restored in 1863 under the direction of Sir G. G. Scott. The manufactures, which are inconsiderable, consist of gloves, leather, turnery, nails, etc. Hereford was long an important garrison town on the Welsh border, and was the last city to surrender to the Parliamentarians. The borough returns one member. Pop. 20,267. The county has an area of 532,898 acres. Wheat is the principal crop, but barley, oats, beans, peas, hops, and turnips are also extensively cultivated. Orchards are numerous, and a large quantity of excellent cider is made. The Herefordshire cattle are held in high estimation for meat, though not good milkers.

Horses are bred in considerable numbers. Oak timber is abundant, and forms, with oak bark, an article of export. Pop. 115,986.

Heretic, one who embraces a heresy, that is, one who holds some theological doctrine which conflicts with the beliefs of the Catholic or universal church, but who, at the same time, calls himself a Christian. Many of the early Christians preserved their Jewish or Greek philosophical notions, and mingled them with the doctrines of Christianity. Even in the time of the apostles we find traces of the Gnostics; and subsequently a great variety of heretical sects or sectaries arose. Among the chief may be mentioned the Manichæans, Sabellians, Arians, Apollinarians, Nestorians, Monophysites, Pelagians, Monothelites, Paulicans, etc. Among religionists stigmatized as heretics in later times by the Roman Catholic Church, were the Waldenses, the Wycliffites, Hussites, Lutherans, and all Protestant sects and churches. Before Christianity was made the religion of the Roman state, nothing but excommunication was inflicted upon the heretic; but severe laws were passed soon after the conversion of the emperors. The code of Justinian contains many ordinances against heretics, and the canon law made it a duty to denounce them, under pain of excommunication. As early as 385 Priscillian was condemned to death as a heretic by the Spanish bishops at the Council of Trèves; but the persecution of heretics properly so called, began in the pontificate of Gregory VII, in the eleventh century. Spain, Italy, and France, from the thirteenth to the sixteenth century, suffered much from these persecutions, but the states of Germany showed greater moderation. In England the burning of heretics was practised before 1200, and continued for a long period of time. Heresy is now left entirely to the cognizance of the ecclesiastical authorities.

Hermes, called by the Romans *Mercurius* (see *Mercury*), in Greek mythology the son of Zeus and Maia, the daughter of Atlas. He was born in Arcadia, and soon after his birth left his cradle and invented the lyre by stringing the shell of a tortoise with three or seven strings. The lyre, however, he resigned to Apollo, with whom it was ever after identified. Hermēs also invented the Pandean pipe. The ancients represent Hermēs as the herald and messenger of the gods. He conducted the souls of the departed to the lower world. He was the ideal embodiment of grace, dignity, and persuasiveness, but also of prudence, cunning, fraud, perjury, theft, and robbery. His cunning was frequently of service both to the gods and the heroes, and even to Zeus himself. Later writers ascribe to him the invention of dice, music, geometry, letters, etc. He was worshiped in all the cities of Greece, but Arcadia was the chief place of his worship, his festivals being called *Hermæa.* In the monuments he is represented as in the flower of youth, or in the full power of early manhood. He often appears with small wings attached to his head and to his ankles. Among his symbols are the cock, the tortoise, a purse, etc., and especially his winged rod, the *caduceus.*

Hermetic Sealing, the term used to denote a very old process in which a glass vessel, such as a tube or flask, has its neck so fused together that no part of the contained matter can escape, and nothing foreign can get in.

Hermit crab, a name common to a family of well-known crustaceans. These crabs take possession of and occupy the cast-off univalve shells of various molluscs, carrying this habitation about with them, and changing it for a larger one as they increase in size. There are several species of various sizes, chiefly belonging to tropical shores.

Hermit crab shifting from one whelk shell to another.

Hermon, a mountain of Syria, belonging to the Anti-Lebanon, about 9,400 ft. high.

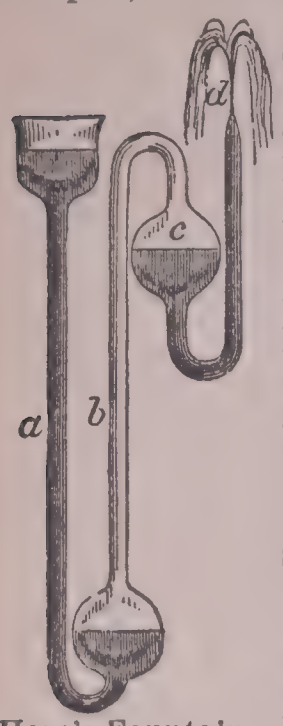
Hermosillo (-sil′yō), a city in the state of Sonora, Mexico, on the river Sonora, 110 mi. n. from the port of Guaymas, with which it has a large traffic. It has a mint, distilleries, and flour mills. Pop. 14,000.

Hernia, in surgery, a tumor formed by the displacement of a soft part, which protrudes by a natural or accidental opening from the cavity in which it is contained. The brain, the heart, the lungs, and most of the abdominal viscera may become totally or partially displaced, and thus give rise to the formation of hernial tumors. But the term is ordinarily applied to abdominal hernia.

Hero, a Greek priestess of Aphrodītē at Sestos, on the coast of Thrace, for love of whom Leander, a youth of Abydos, swam every night across the Hellespont, guided by a torch from her tower. He was at length drowned in the attempt and his body washed ashore, when Hero, overcome with anguish, threw herself from the tower on the corpse of her lover, and perished.

Hero (of Alexandria) (B. C. 150–100), one of the most distinguished mathematicians and machinists of ancient times. A common

pneumatic toy called Hero's fountain, is attributed to him, and he also invented the æolipile, a heliostat, etc.



Hero's Fountain.

Her'od, called The Great (B.C. 74–4), king of the Jews, was a native of Ascalon, in Judea. Julius Cæsar appointed Herod to the government of Galilee. After the battle of Actium he successfully paid court to Augustus, who confirmed him in his kingdom. He rebuilt the temple at Jerusalem with great magnificence, and erected a stately theater and amphitheater in that city. The birth of Jesus Christ is said to have taken place in the last year of the reign of Herod, viz., B.C. 4, the year also signalized by the massacre of the children of Bethlehem. Herod's policy and influence gave a great temporary splendor to the Jewish nation, but he was also the first to shake the foundation of the Jewish government, by dissolving the national council, and appointing the high priests and removing them without regard to the laws of succession.

Herod Agrippa I, son of Aristobulus by Berenice, daughter of Herod the Great. From his attachment to Caligula he was imprisoned by Tiberius, but on the accession of Caligula (A.D. 37) he received the government of part of Palestine, and latterly all the dominions of Herod the Great. To please the Jews, with whom his rule was very popular, he caused St. James to be put to death, and imprisoned St. Peter. He died in the circumstances related in Acts 12, in A.D. 44.

Herod Agrippa II, son of the preceding, and last of the Herodian line. Being too young to govern, Judea was, on his father's death, reduced to a Roman province. He subsequently received the kingdom of Chalcis, and obtained the superintendency of the temple of Jerusalem, where, with his sister Berenice, he heard the defense of Paul before Festus. Being driven from Jerusalem by the revolt of the Jews, he joined Cestius, and later on Vespasian, and during the siege of Jerusalem was very serviceable to Titus. After its reduction (A.D. 70) he and Berenice (with whom he was suspected to have an incestuous intercourse) returned to Rome. He is supposed to have died there, A.D. 94.

Herod An'tipas, son of Herod the Great by his fifth wife, Cleopatra, was appointed tetrarch of Galilee on his death (B.C. 4). This was the Herod who put to death St. John the Baptist, in compliment to his wife Herodias in revenge for his reproaches of their incestuous union. Having visited Rome he was accused of having been concerned in the conspiracy of Sejanus, and was stripped of his dominions, and sent (A.D. 39) with his wife into exile at Lugdunum (Lyons), or, as some say, to Spain, where he died.

Herod'otus (B. C. 484–409), the oldest Greek historian whose works have come down to us, the "father of history," was b. at Halicarnassus in Asia Minor. Before writing his history he traveled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon, and Ecbatana, Egypt as far as Elephantine, and other parts of Northern Africa, everywhere investigating the manners, customs, and religion of the people, the history of the country, productions of the soil, etc. On returning home he found that Lygdamis had usurped the supreme authority in Halicarnassus, and put to death the noblest citizens, among others his uncle, the epic poet Panyasis, and Herodotus was forced to seek an asylum in the island of Samos. Having formed a conspiracy with several exiles he returned to Halicarnassus and drove out the usurper, but the nobles who had acted with him immediately formed an aristocracy more oppressive than the government of the banished tyrant, and Herodotus withdrew to the recently founded colony of Thurii, in Italy, where he seems to have spent most of his remaining life. Here, at an advanced age, we are told by Pliny, he wrote his immortal work, a statement strengthened by the fact that events are noticed in the body of the book which occurred as late as 409 B. C., while its abrupt ending proves almost beyond question that he was prevented by death from completing it.

Heron, the common name of birds of the genus *Ardea*, constituting with the bitterns the family Ardeidæ, type of what is now commonly regarded as a separate order of birds, the Herodiones. The herons are very numerous, and

Common Heron.

almost universally spread over the globe. They are distinguished by having a long bill cleft beneath the eyes, a compressed body, long, slender legs naked above the tarsal joint, three toes in front, the two outer united by a membrane,

and by moderate wings. The tail is short, rounded, and composed of ten or twelve feathers. The common heron is about 3 ft. in length from the point of the bill to the end of the tail, builds its nest in high trees, many being sometimes on one tree. Its food consists of fish, frogs, molluscs, mice, moles, and similar small animals. It has an insatiable voracity, and digests its food with great rapidity. It haunts fresh-water streams, marshes, ponds, and lakes, as also the sea-shore. It was formerly in high esteem for the table, and, being remarkable for its directly ascending flight, was the special quarry pursued in falconry by the larger hawks. The great heron is an inhabitant of America, and is called also great blue heron; the great white heron or egret belongs to Europe; and the green heron, the flesh of which is much esteemed, is a native of North America.

Herre′ra, Francesco (1576–1656), one of the greatest painters of the Seville school. He designed with great spirit and vigor, and may justly be regarded as the founder of a new national school. His *Last Judgment* is a masterpiece of design and coloring. Equal praise is due to his *Holy Family* and the *Outpouring of the Holy Spirit.* He also displayed much skill in fresco painting and bronze work.

Herring, the general name of fishes, the most important of which is the common herring. It is of wide distribution in the North Atlantic, 45° n. lat. being about the southern limit. It measures from 10 to 12 in. in length, with blue-green back and brilliant silvery white under parts. It has small teeth in both jaws, and is of an elegant shape, the body being much compressed. It was formerly supposed that the herrings migrated in two great shoals every summer from the Polar Seas to the coasts of Europe and America, returning in the winter, but the migration is probably only from a deeper part of the ocean to a shallower. The feeding ground of the herring is probably the mud deposits found in the deeper parts of the sea, and it seems to be a fact that during their visits to the shallower waters of the coast for the purpose of spawning they do not feed, or feed very little. In summer the herring leaves the deep water where it has passed the winter and spring months, and seeks the coast where it may deposit its ova, and where they may be exposed to the influences of oxygen, heat, and sunlight, which are essential to their development. They are generally followed by multitudes of hakes, dogfishes, etc., and gulls and other sea birds hover over the shoals. They swim near the surface, and are therefore easily taken by net. So great is their fecundity that the enormous number taken appears to produce no diminution of their abundance, as many as 68,000 eggs having been counted in the roe of one female. Herring, without any apparent cause, often desert parts of the coast where for a time they have been remarkably abundant, not returning in similar plenty till after the lapse of a number of years. Such seems to be the case on eastern coasts. The American species differs somewhat in its external appearance from the common Euro-

pean species. It varies in length from 12 to 15 in.; the color above is deep blue, tinged with yellow, with silvery sides and lower parts. Herring are full of roe in the end of June, and continue in season till the beginning of winter, when they deposit their spawn. The mode of fishing for herring is by drift nets, very similar to those employed in the pilchard fisheries; the fishing is carried on only in the night, the most favorable time being when it is quite dark, and the surface of the water is ruffled by a breeze. The food of the herring is believed to consist chiefly of minute crustaceans and *acaleptræ;* but it feeds also on small fishes, even the young of its own species. Other prominent members of the herring family are the sprat or garvie, the pilchard or gypsy herring, the whitebait, anchovy, etc.

He′siod, one of the oldest poets of Greece, belonging to the eighth century B. C., and connected with Ascra, a village of Bœotia, at the foot of Mount Helicon. Little is known of his life. Of numerous works attributed to him there only remain the *Theogony,* a collection of the oldest fables concerning the birth and achievements of the gods; the *Shield of Heracles,* a fragment of a larger work; and a didactic poem, *Works and Days,* which treats of agriculture, the choice of days, etc., with prudential precepts concerning education, domestic economy, etc.

Hesper′ides (-dēz), in Greek mythology, certain nymphs who lived in gardens, of rather uncertain locality, as guardians of the golden apples that grew there, being assisted in the charge by a dragon. Hesiod places the garden in an island of the ocean far to the west. It was the eleventh labor of Hercules to kill the dragon and bring the golden apples of the Hesperides to Eurystheus.

Hesperor′nis, a fossil bird found in the chalk formation of Kansas, about 6 ft. long,

Restoration of Skeleton of *Hesperornis regalis; a.*—tooth of do. with germ of second tooth (magnified).

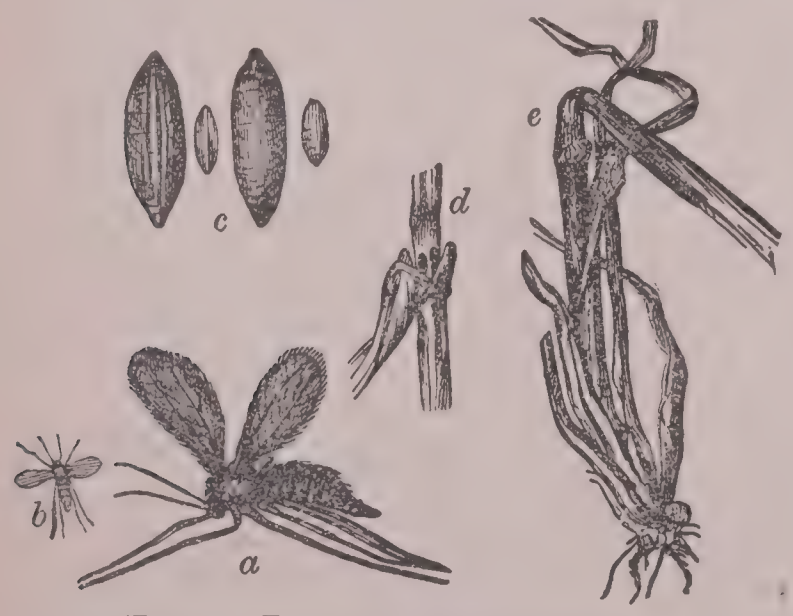
without wings, and having its jaws armed with teeth, which are not set in sockets, but in a common groove. It has been described as "a

kind of swimming, loon-like, raptorial ostrich, without forelimbs, with the gape armed with formidable rows of strong teeth like a gigantic lizard, and with a large, broad, and flattened tail like a beaver."

Hesse (or Hessen), GRAND-DUCHY OF, formerly known as *Hessen-Darmstadt*, an independent state of South Germany, consisting of sundry distinct portions. Of the two main portions, one (forming the provinces of Rheinhessen on the left, and Starkenburg on the right bank of the Rhine) lies immediately to the north of Baden, the other, Oberhessen (Upper Hesse), is entirely enclosed by the Prussian province of Hessen-Nassau; area of whole grand-duchy, 2,964 sq. mi. The vine forms a most important object of culture, and fruit is very abundant. The principal towns are Darmstadt, the capital, Mainz, Giessen, Bingen, and Worms. About two thirds of the inhabitants are Protestants. Pop. 956,611. The Grand-duchy of Hesse originated in the division of the Langraviate of Hesse in 1567. In 1806 the landgraviate was erected into a grand-duchy with an enlarged territory by Napoleon. It was reduced to its present limits in 1866, when it had to cede to Prussia some districts in the north, besides Hesse-Homburg, which after being separated from it since 1596, had been reunited to it in the beginning of the year in which it was ceded. The reigning grand-duke, Ludwig (Louis), was married to Princess Alice of Great Britain.

Hesse-Nassau (or Hessen-Nassau), a province of Prussia, formed out of the former principality of Hesse-Cassel, the duchy of Nassau, the landgraviate of Hesse-Homburg, the territory and town of Frankfort, etc. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woolens, cottons, and linen. The principal towns are Cassel, the capital, Wiesbaden, and Frankfort. Pop. 1,592,454.

Hessian Fly, a fly of the family Tipulidæ, of the order Diptera (two-winged flies), the



Hessian Fly (*Cecidomyia destructor*).
a.—magnified; *b*.—natural size; *c*.—pupa cases ("flax seed") in different stages, natural size and magnified; *d*.—barley stem, showing "flax seeds" *in situ*; *e*.—stem elbowed down.

larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats).

It is so named from the unfounded belief, prevalent in America, where it is specially destructive, that it was brought over to this country in the baggage of the Hessian mercenaries employed against the Americans in the War of Independence. The female fly is about the eighth of an inch in length, with a wing expanse of about a quarter of an inch. Its body is brown, with the upper parts, the thorax, and the head, of a darker shade approaching to black. The wings are of a dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female and has longer antennæ. The female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These work themselves in between the leaf-sheath and the stem, and fix themselves near the lowest joints, often near the root, and suck the juices of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupæ, from which the flies develop in about ten days. It has long been a pest in America and Germany.

Hessians, the mercenary auxiliaries hired by Great Britain of the landgrave of Hesse to serve against the American patriots. Over 15,700 of them were killed in the war and upwards of 2,000 surrendered at Bemis Heights near Saratoga. They were rapacious foragers and by their cruelties exasperated the American soldiery.

Heterogen'esis, a term sometimes used as equivalent to spontaneous generation; otherwise applied to alternate generation.

Heyse (hī'zė), PAUL JOHANN LUDWIG, b. 1830, German novelist and dramatist. His fame rests on his great novels, *The Children of the World*, *The Paradise Club*, generally recognized as among the most powerful and artistic works of modern German fiction.

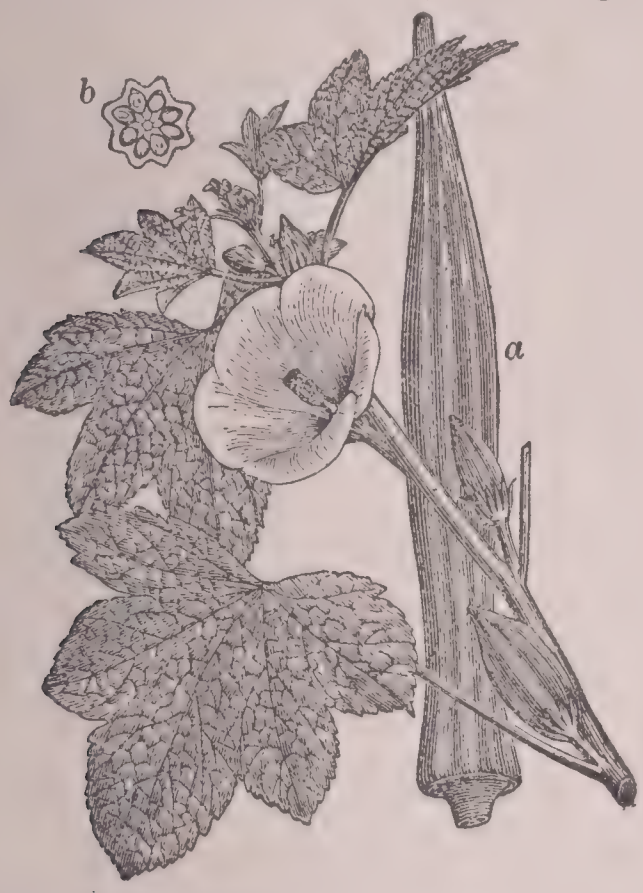
Hezeki'ah, the twelfth, and one of the best of the kings of Judah. He succeeded Ahaz about 717 B. C., and d. about 698 B. C. He repressed idolatry, fought successfully against the Philistines, and hoped to become entirely independent of Assyria, but had his fenced cities captured, and was mulcted in a large tribute.

Hiawatha, the name of a mythical personage of miraculous birth, believed by the North American Indians to be sent among them to clear the rivers, forests, and hunting grounds, and to teach them the arts of peace. The myth has been made the subject of a famous poem by Longfellow.

Hiber'nia, the ancient name of Ireland, applied to it first by Julius Cæsar. Aristotle mentions this island by the name of *Ierne*; Pomponius Mela calls it *Iverne;* Ptolemy *Iuvernia.*

Hibis'cus, an extensive genus of plants, nat. order Malvaceæ (mallows), chiefly natives of tropical climates. They have large showy flowers, borne singly upon stalks toward the ends of the branches, these flowers having an outer calyx (called the epicalyx) of numerous leaves in addition to the true five-lobed per-

sisten calyx. They are chiefly shrubs, one or two being herbs, and a few attaining the dimension of trees. The species are remarkable for abounding in mucilage and for the tenacity of the fiber of their bark, whence several are employed for many economical purposes in the different countries where they are indigenous.



Hibiscus esculentus, upper part of a flowering plant. *a.*— unripe fruit; *b.*— section of do.

The petals of a plant with large, handsome, usually red flowers, frequent in greenhouses, are astringent, and used in China as a black dye for the hair and eyes. The root yields a mucilage used in Japan as size and to give a proper consistence to paper. The leaves are eatable, and an oil is extracted from its seeds, while it is cultivated in India for its fiber, and hence known as Indian hemp.

Hick′ory, the name given to several species of timber trees belonging to the nat. order walnut. They are natives of North America, and are remarkable for stateliness and general beauty. The wood is heavy, strong, and tenacious, and is used for making carriage shafts, screws, whip handles, cogged wheels, etc. The shagbark yields the hickory nut of commerce, and its wood is very valuable.

Hides, the skins of animals, either raw or dressed; but the name is more commonly given to the undressed skins of the larger domestic animals, as oxen, horses, etc., the smaller being called skins. The hide trade is now an important one. When the cattle are slaughtered at the stockyards their hides are sprinkled with a thin layer of salt, rolled up in compact bundles, and taken away to the tannery. Here they go into a long steaming room known as the "beam house." The workmen untie them and drag them into a big vat of clear running water where they are soaked and cleaned for three or four days. When the hide is thoroughly washed it is dragged out and placed in another vat filled with a thin solution of lime. This starts the process of swelling the

outer cellular coat of the hide and loosens the hair. It goes through a graduated series of vats containing more lime. It is necessary that the hides do not have too little or too much lime. The "scrapers" or "fleshers," with instruments resembling draw-shaves then take hold of the work. The hides are placed one by one on the shoulders of an inclined and rounded saw-horse. The hair and any clinging bits of flesh are scraped off. The product of hair thus obtained is dried and sold to plasterers to be used in making walls and ceilings of houses. The hide is now "baited" through bran water and some other solution to neutralize the lime still remaining in the pores. After drying, the hides are ready to enter the real process of tanning. This work is done in long rooms in which there are vats even with the floor, and the hides are placed in the vats which are filled with tan liquor. Tan liquor is made by soaking hemlock bark. Oak and sumac bark are also used. The vats are arranged in rows and each is filled with dark brown liquor, graduated from a thin solution in the first to a strong one in the last. The hides are passed from one vat to the other, the whole operation requiring five or six weeks. The tan liquor acts on the fibers of the hide as an astringent, making them more compact, and at the same time leaving them supple. The purpose of this process is to put the hides in such a condition that they will resist the tendency of nature to putrefy. After leaving the tan room the hides are fed between the rollers of a device which cuts them into slices of varying thickness. The unsplit hide is called sole leather. The leather is now pared down thin and rubbed hard or curried with a wooden instrument. The water is then "slicked out" with a scraper and cod oil and tallow are rubbed into both sides of the skin with a brush. It is next rubbed for the purpose of making the leather smoother and more supple. For black leather a mixture of lampblack and soap or oil is painted on and afterward it is given a gloss or polish by a roller machine. After being sized with a paste of brown soap and tallow the hide is hung up to dry and in a week is ready for the market. The whole process requires about three months. Russet leather is made by treating the hides after being dried, with a coloring compound made of birch oil. In making enamel leather, the surface of the leather is first polished smooth and then coated with a mixture of lampblack, linseed oil, umber, and litharge.

Hi′erarchy (from Gr. *hieros*, sacred, and *archē*, government), sacred government, sometimes the church, sometimes the rule which the ecclesiastical governing body exercised as at once priests and civil magistrates. In the former sense the hierarchy arose with the establishment of the Christian church as an independent society. In the Middle Ages the papal hierarchy gathered great strength, and the pope became a spiritual monarch, ruling western Christendom with power but feebly limited by princes and councils. A reactionary movement began in the fourteenth

century, and the general tendency of subsequent events has always been to make the civil and hierarchical power more and more independent of each other. The term *hierarchy* as used to denote the governing and ministering body in the church, according to its several gradations, can strictly be applied only to those churches which are ruled by bishops, such as the Roman Catholic Church and the Anglican Church, which also holds the theory of a hierarchical gradation of rank and authority. Both these churches comprise the three orders of bishops, priests, and deacons.

Hi'ero I, ancient Greek ruler (or "Tyrant"; that is, absolute monarch) of Syracuse in Sicily, brother of Gelon, whom he succeeded in 478 B. C. He was an enlightened ruler, and a patron of genius and learning.

Hiero II, king or tyrant of Syracuse (269–214 B. C.), son of Hierocles, a noble Syracusan, who claimed a descent from the family of Gelon. He was chosen by the soldiers as general in 275 B. C., and recognized as king about 270.

Hieroglyphics, a term originally applied to the inscriptions sculptured on buildings in Egypt, in the belief that the writing was confined to sacred subjects, and legible only to the priests. The term has also been applied to picture writing in general, such as that of the Mexicans and the still ruder pictures of the North American Indians. Three different modes of writing were used by the ancient Egyptians, the *Hieroglyphic*, the *Hieratic*, and the *Demotic*. Pure hieroglyphic writing is the earliest, and consists of figures of material objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the hieratic or priestly writing, the form in which most Egyptian literature is written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B. C. are extant. In the demotic or *enchorial* writing, derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the ninth century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the eighteenth century scholars failed to find a clue to the hieroglyphic writings. In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a trilingual inscription in hieroglyphics, demotic characters, and Greek, which turned out to be a decree of the priests in honor of Ptolemy V, issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. The discovery of an alphabet was the first task. The demotic part of the inscription was first examined by De Sacy and Akerblad, and the signification of a number of the symbols ascertained. The hieroglyphic part was next carefully examined

and compared with the demotic and Greek. At last after much study Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing.

Hieroglyphic characters are either *ideographic*, i. e., using well-known objects as symbols of conceptions, or *phonetic*, i. e., representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough; thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water, milk by a milk jar, oil by an oil jar, fishing by a pelican seizing a fish, i. e., fishing; seeing and sight by an eye; and so on. The nature of the phonetic hieroglyphs, which represent simply sounds, will be understood from the following explanation.

1, The first hieroglyph in the name of Kleopatra is a knee, which is *kne* or *kle* in Coptic, and represents the K of Kleopatra. K does not occur in the name Ptolemaios. 2, The second hieroglyph in Kleopatra is a lion couchant, which is *laboi* in Coptic and *labu* in the old Egyptian, and represents the L of both names. In Kleopatra it occupies the second place, and in Ptolemaios the fourth. 3, The third hieroglyph in Kleopatra is a reed, which is *aké* in Coptic and *aak* in the old Egyptian, and represents the E of Kleopatra. The reed is doubled in Ptolemaios and occupies the sixth and seventh places, where it represents the diphthong *ai* of Ptolemaios. 4, The fourth hieroglyph in Kleopatra is a noose, which represents the O of both names, and occurs in the third place of Ptolemaios. 5, The fifth hieroglyph in Kleopatra is a mat, which represents the P of both names, and is the initial of Ptolemaios. 6, The sixth hieroglyph in Kleopatra is an eagle, which is *akhoom* in Coptic, and represents the A, which is found twice in the name Kleopatra, but does not occur in the name Ptolemaios, although the diphthong *ai* occurs as described above, in No. 3. 7, The seventh hieroglyph in Kleopatra is a hand, which is *toot* in Coptic, and represents the T of Kleopatra, but does not occur in Ptolemaios, where it might be expected to occupy the second place. The second place in Ptolemaios is occupied by a semicircle, which is found at the end of feminine proper names and is the Coptic feminine article T. The researches of Champollion satisfied him of the existence of homophones, or characters having the same phonetic value, and which might be interchanged in writing proper names. 8, The eighth hieroglyph in Kleopatra is a mouth, which is *ro* in Coptic, and represents the R of Kleopatra. 9, The ninth hieroglyph in Kleopatra is the eagle, which is explained in No. 6 above. 10, The semicircle is the T of Ptolemaios, which with 11, the egg found at the end of proper names of

women, is a feminine affix. In the name of Ptolemaios there is still the M and the S to account for. The fifth hieroglyph in the cartouche of Ptolemaios is a geometrical figure, consisting of three sides of (probably?) a parallelogram, but now called a hole, because the Coptic *mu* has that signification, and represents the M. The hook represents the S of the word Ptolemaios. Vowels were only regarded by the Egyptians as they were needed to avoid ambiguous writing.

There are groups of hieroglyphs of which one element is an ideographic sign, to which a phonetic complement is added to indicate the pronunciation of the ideographic sign. The words of a text could be written in hieroglyphs in three ways: 1, by phonetic hieroglyphs; 2, by ideographic hieroglyphs; and 3, by a combination of both. According to Ebers, in the perfected system of hieroglyphics the symbols for sound and syllables are to be regarded as the foundation of the writing, while symbols for ideas are interspersed with them, partly to render the meaning more intelligible, and partly for ornamental purposes, or with a view to keep up the mystic character of the hieroglyphics.

Higginson, Thomas Wentworth, b. 1823, at Cambridge, Mass. He graduated at Harvard in 1841, and began preaching. Subsequently he left the ministry to devote himself to literature, and became conspicuous as an antislavery agitator. In 1862 he served as captain of the fifty-first Massachusetts regiment, and on November 16 of that year was made colonel of the thirty-first South Carolina volunteers, the first regiment of freed slaves mustered into the national service. He took Jacksonville, Fla., and was wounded at Wiltown Bluff, S. C., in 1863, and resigned from the army in 1864. He has written for the *Atlantic Monthly* and other magazines on his favorite topics.

Highlands, Arapahoe co., Colo., a suburb of Denver.

High Seas, the open sea or ocean. The claims of various nations to exclusive rights and superiority over extensive tracts of the ocean highway have been settled after much controversy by a general international law. The principle now accepted is that the jurisdiction of maritime states extends only for 3 mi., or within cannon range of their own coasts; the remainder of the seas being high seas, accessible on equal terms to all nations. Inland seas and estuaries, of course, are excepted.

Hildreth, Richard (1807–1865), historian, was born in Massachusetts. He graduated at Harvard in 1826. After practising law for two years he became editor of the *Boston Atlas*, a leading political paper, in which his articles were remarkable for vehemence and historical illustration. In 1840 he went to Demerara, British Guiana, editing successively several journals. His *History of the U. S.* is a standard work.

Hill, Ambrose Powell (1825–1865), American soldier. He graduated at the U. S. Military Academy in 1847, entered the first artillery, and was made second lieutenant. He served in the Mexican War, and afterward on the frontier and in Florida. Later he was promoted captain. At the outbreak of the Civil War he entered the Confederate service, was appointed colonel of the thirteenth regiment Virginia volunteers, and ordered to Harper's Ferry. He fought at the first battle of Bull Run, was promoted to brigadier general, and later was made major general.

Hill, Daniel Harvey (1821–1889), American soldier. He graduated at the West Point Military Academy in 1842, served throughout the Mexican War, and attained the brevet of major. At the beginning of the Civil War he was made colonel of the first North Carolina regiment. On June 10, 1861, he fought the battle of Big Bethel, was soon promoted brigadier general, and sent to Leesburg, Va. On March 26, 1862, he was advanced to major general.

Hill, David Bennett, an American politician, was b. in Havana, N. Y., 1843. He was admitted to the bar in 1864, and in 1870–71 served in the state legislature. In 1882 he was elected mayor of Elmira: in November of the same year, lieutenant governor of New York state, and in 1884, when Grover Cleveland resigned the position of governor, Mr. Hill took his place. In 1885 he was elected governor for the term expiring in 1888, and was re-elected in that year. He then became U. S. senator for New York state, but failed of re-election because the state legislature elected in 1896 was republican.

Hilo, the chief town of the island of Hawaii, and the second largest in the Sandwich Islands. Pop. 6,000.

Himálaya, a chain of snowy mountains in Asia, the most elevated on the earth, which separates the Indian Peninsula from the plateau of Thibet. Length about 1,500 mi. average breadth about 180 mi. The general height of the Himálayas is double that of the Alps; the passes over the former ordinarily exceed, often by half a mile, the elevation of Mont Blanc. The Ibi-Gamin Pass in Garhwal, the highest of all, is 20,457 ft., the Mustagh 19,019 ft., the Parangla 18,500 ft., the Kronbrung 18,313 ft., and the Dura Ghát 17,750 ft. high. There are several summits in the Himálaya which approach closely to double the absolute elevation of the highest of the Alps, and 120 of them are stated to be above 20,000 ft. The rivers of the Punjab ("Five Waters") spring from a portion of the great chain which may be considered a distinct group under the title of the Northwestern Himálaya. Some of the peaks here rise to a height of 24,000 to 25,000 ft; or to 28,278 ft. if the Karakorum is regarded as part of the Himálayas. In the Central or Middle Himálaya rise the sources of the Ganges and Jumna, in a region regarded by the Hindus as holy ground. Farther eastward, in Nepal, is the highest part of the Himálaya, as far as it is known and measured. Dhawalagiri has an elevation of 26,826 ft., the Gaurisankar or

Mount Everest, the highest known mountain in the world, is 29,002 ft., the Yassa group rises to the height of 20,680 ft., the Ibjibia group to 26,306. The snowy ridge of the Himálayas, as far as examined, consists everywhere of granite, with which are immediately associated gneiss and micaslate, followed, in descending, by metamorphic and secondary rocks till we arrive at the more recent alluvial deposits. Earthquakes are still frequent within this region; and hot springs gush forth in abundance, even from beneath the snow. The vegetation of the Himálayas is very rich, there being forests of pine, spruce, silver fir, and deodar cedar at suitable elevations, with rhododendrons in rich profusion. Among the more characteristic animals are the yak, musk-deer, wild sheep, etc.

Hindu Kush (or Indian Caucasus), a mountain system of Central Asia. It is generally considered as a continuation of the Himálayas. Its culminating point, in the range of Hindu-Koh, to the north of Cabul, is far beyond the limit of perpetual snow, but is not supposed to exceed 20,000 ft.

Hindustan, the name commonly given to the whole Indian empire, but which properly applies only to the Punjab and Ganges valley.

Hippar'chus (B. C. 160–125), ancient Greek astronomer, was born at Nicæa in Bithynia. He resided for some time at Rhodes, but afterward went to Alexandria, then the great school of science. A commentary on Aratus is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, prepared a catalogue of the fixed stars, etc.

Hippa'rion, a fossil genus of the horse family, of the Upper Miocene and Pliocene periods. The members are distinguished by the fact that each foot possesses a single fully-developed toe, bordered by two functionless toes which do not touch the ground, but simply dangle on each side of the central toe. The hipparion was about the size of an ass, one American species being, however, about the size of a goat.

Hippocampus.

Hippocam'pus, a genus of fishes, closely allied to the pipe-fishes, of singular construction and peculiar habits; the upper parts have some resemblance to the head and neck of a horse in miniature, which has suggested the name. When swimming they maintain a vertical position. Their general length is from 6 to 10 inches, and they occur in the Mediterranean and Atlantic.

Hippoc'rates (B. C. 460–357), the most famous among the Greek physicians, the father of medicine, b. in the island of Cos. Besides practising and teaching his profession at home he traveled on the continent of Greece, and died at an advanced age at Larissa, in Thessaly. His writings, which were early celebrated, became the nucleus of a collection of medical treatises by a number of authors of different places and periods, which were long attributed to him, and still bear his name. The best edition is that of Littré. Among his genuine writings are the first and third books on epidemics; the aphorisms; on diet in acute diseases; on air, waters, and localities; on prognostics; on wounds of the head. Hippocrates was one of the first to insist on the importance of diet and regimen in disease. He had remarkable skill in diagnosis, practised auscultation, and taught the doctrine of "critical days."

Hip'podrome, the Greek name for the public place where the horse and chariot races were held. In Byzantine times the hippodrome at Constantinople acquired great renown, and factions originating in the hippodrome caused perpetual confusion in all departments of the public service. The name is sometimes applied to a modern circus.

Hippopot'amus, the typical genus of a family of Ungulates, of which two living species are known. One species is of large size, and is common throughout the greater part of Africa; the other is not only smaller, but has other important differences, and is

Hippopotamus.

found only in the African west coast rivers, and those flowing into Lake Tchad. The former species has a thick and square head, a very large muzzle, small eyes and ears, thick and heavy body, short legs terminated by four toes, a short tail, two ventral teats, skin about 2 in. thick on the back and sides, and without hair, except at the extremity of the tail. The incisors and canines of the lower jaw are of great strength and size, the canines or tusks being long and curved forward. These tusks sometimes reach the length of 2 ft. and more, and weigh upward of 6 lbs. The animal is killed by the natives partly as food, but also on account of the tusks and teeth, their hard-

ness being superior to that of ivory, and less liable to turn yellow. The hippopotamus has been found of the length of 17 ft., and stands about 5 ft. high. It delights in water, living in lakes, rivers, and estuaries, and feeding on water plants or on the herbage growing near the water. It is an excellent swimmer and diver, and can remain under water a considerable time. The *behemoth* of Job is considered by commentators to be the hippopotamus, as the description of his size, manners, food, and haunts is not unlike those of the latter animal. Among the ancient Egyptians it was revered as a divinity, as it is among the negroes in some localities. Several extinct species are found in old world tertiary and diluvial formations.

Hirsch, Emil G., rabbi, b. in Luxemburg in 1852 and came to the U. S. in 1866. He was graduated from the universities of Pennsylvania, Berlin, and Leipsic. At different times he has been rabbi at Baltimore, Chicago, Louisville, and is at present professor of Hebrew in the University of Chicago. A volume of his sermons has been published.

Hirsch, Maurice, Baron (1831–1896), financier and philanthropist; b. of Jewish parentage in Batavia. His father, a merchant, was ennobled in 1869. Baron Hirsch accumulated his great fortune in the banking house of Bischoffscheim and Goldsmid, in constructing railroads, and in other enterprises. The railroad system from Budapest to Varna was constructed through his efforts. By his munificent gifts he promoted the cause of education in various parts of the world. In Egypt and Turkey he founded industrial schools, and, in 1888, offered the Russian government $10,000,000 for schools on the condition that race and religious distinctions should not influence the distribution of the fund. It is reported that in one year alone he gave $15,000,000 to charity. In 1892 his contribution for the benefit of Jewish emigrants from Russia to America amounted to $2,500,000.

Hissar', a town in Hindustin, in the Punjab, administrative headquarters of district of the same name, on the Western Jumna Canal, 102 mi. w. of Delhi. Pop. 14,167. The district has an area of 3,540 sq. mi.; pop. 504,183. Hissar is also the name of a division under a commissioner in the Punjab, comprising the three districts, Hissar, Rohtak, and Sirsa. Area 8,355 sq. mi.; pop. 1,311,067.

Histology (literally, the science of tissues), represents that part of general morphology which treats of the structural elements of organisms by the arrangement of which the textures and organs of the body are formed. It describes the textures of the tissues as seen through the microscope and is hence called *microscopical* or *textural anatomy.* As all forms of tissue originate from the primitive embryonal cell, it is important to understand the structure and development of this cell, which in the human type is called the *ovum.* The empryonal cell or ovum is a small irregularly round or oval mass of finely granular protoplasm, in some part of which a smaller and often indistinct spherical body called the *nucleus,* lies imbedded. This protoplasm, of which the greater part of the cell is composed, is very complicated in structure and comprises a highly elastic and extensible portion, the *spongioplasm,* and an interstitial less active substance, the *hyoloplasm.* The nucleus is limited by a distinct wall, the *nuclear membrane,* and is traversed by a variably elaborate framework of *nuclear fibrils,* between which lies an interfibrillar substance, the *nuclear matrix.* In recognition of the marked affinity for certain dyes possessed by the nuclear fibrils, the substance composing them is termed *chromatin,* while the but slightly staining nuclear matrix is called *achromatin.* Within the nuclear network one or more minute spherical bodies may often be seen; these are the *nucleoli,* whose tissue value has not been determined. Recent investigations have proven the occasional presence of an irregularly spherical body lying within the protoplasm close to the nucleus; this is called the *paranucleus,* the function of which is obscure. The presence of a very small highly refracting body, the *centrosome,* has been proven; around this centrosome is an area named the attraction sphere. These features are especially important in connection with the division of the cell in its growth.

Vital Manifestation of the Cell.—The characteristics which distinguish organic from inorganic bodies are grouped as follows:—

I. Vegetative.

(*a*) *Metabolism.*—"The processes by which the cell selects and assimilates, from the surrounding food materials, those substances adapted to the particular needs for its nutrition and function, so changing and incorporating into its own substance the materials so acquired that they become an integral part of the cell."—*Piersol.*

(*b*) *Growth.*

(*c*) *Reproduction:* 1, By direct division. By this process a cell rich in protoplasm constricts, cuts off, and sets free a portion of itself. 2, By indirect division. This is the usual mode of reproduction of cells. The division is preceded by a complicated cycle of nuclear changes collectively termed "karyokinesis," which in brief is as follows: Beginning with the nucleus in the resting stage, when about to undergo cell division we notice that the nucleus becomes larger, the chromatin greatly increases, the fibrils becoming densely convoluted. These convoluted fibrils constitute a *Close Skein.* The next step is the thickening of these fibrils and their breaking up to form irregularly arranged loops known as the *Loose Skein.* The fibrils of this loose skein separate at their peripheral turns so that a number of distinct loops are formed. The closed ends of these loops are directed toward the center. The enclosed clear space in the center is called the *Polar Field.* While the loose skein is being formed an important change is taking place in the achromatin. We notice that delicate *striæ* make their appearance, so disposed that together they form a

double core whose bases occupy the polar field, and whose apices are directed toward the poles of the future new nuclei. These achromatin figures constitute the *Nuclear Spindle.* We next notice that the segments of the loose skein rearrange themselves around the polar field so as to give the appearance of a star, hence the name *Mother Star.* Changes take place quickly now and we observe that the fibrils undergo longitudinal clearage and are entirely rearranged passing toward the poles of the future new nuclei. This stage gives us the *Polar Striation.* The next step is the massing of these segments into the *Equatorial Plate.* The segments then separate into groups at the poles and appear connected by threads of achromatin. These changes give rise to the *Daughter Star*, which by successive changes is converted into *Loose Skein*, *Close Skein*, and *Resting Daughter Nucleus.*

II. Animal.

(*a*) *Irritability.*—That property of living matter by virtue of which external influences are responded to by changes within the cell.

(*b*) *Motion.*—Every tissue is composed of two parts, the cellular elements and the intercellular substance. Upon the first of these depends the vitality of the tissue, while its physical properties are determined by the character of the second. The variations, occurring in the character of the individuals in the cell family descending from the ovum, are so considerable that it is more convenient to study and classify tissues under a less generalized type than the ovum. We therefore trace back each texture to an origin in one of the three primary cell layers into which the ovum through the process of karyokinesis comes to divide itself. We notice that, after the division of the primitive ovum into two cells, the two cells are not similar throughout. These two cells again divide, and division keeps on until the simple ovum is essentially subdivided into a large number of small, nucleated cells, which are aggregated into a solid, spherical mass known as the *mulberry mass.*

A difference, as before stated, exists in the first division of the cell, and this difference is traceable in all the resulting divisions; since the clearer cells divide somewhat more rapidly than the darker ones, the clearer cells will outnumber the latter, and as segmentation proceeds we notice that the clearer cells occupy the superficial part of the ovum and almost entirely enclose the darker granular cells which fill the interior. Soon the granular cells are found to be spreading out over the inner surface of the blastodermic vesicle. As this spreading proceeds the innermost cells separate off as a distinct layer. The outer layer constitutes the primitive ectoderm, while the inner granular layer constitutes the primitive entoderm. The mesoderm or middle layer is generally considered as produced by proliferation of the cells of both the ectoderm and entoderm. Thus our three primitive layers of the blastoderm are:—

1. *Ectoderm* or *epiblast*, and from it originate

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the Nervous System; the skin, with hairs sweat glands, nails, etc.; the lining of the mouth and nose and the enamel of the teeth; the epithelial part of the organs of special sense.

2. *Mesoderm* or *mesoblast*, from which originate the skeleton with the joints, muscles, ligaments, fascias; the blood and blood vessels, including the heart, arteries, veins, lymphatics, and spleen; the serous membranes such as pleura, peritoneum, arachnoid, the urinary and genital organs, except the lining of the bladder and urethra,

3. *Innermost layer of the entoderm or hypoblast*, from which originate the epithelial cells lining the entire alimentary canal except the mouth; the cells of all glands opening into the alimentary canal, such as liver, pancreas, gastric and intestinal glands; the cells lining the larynx, trachea and lungs; the lining of the urethra and urinary bladder, of the tympanum and Eustachian tube, of the thyroid body and thymus gland. At first sight apparently complex and numerous, the structures composing the animal economy are made up of but few elementary tissues; these latter are divided into four fundamental groups: *Epithelial tissues, Connective tissues, Muscular tissues, Nervous tissues.*

Ectodermal and entodermal tissues are differentiated from the type of the epithelial cell, and may either (*a*) remain frankly epithelial in character, as in the flat or columnar epithelium of the skin and respiratory and digestive tracts: (*b*) undergo moderate differentiation into various tissues chiefly of a glandular type tributary to the skin or alimentary tract; (*c*) or may become so specialized that only the embryologist can recognize any identity of origin with the simple epithelial cell. In this latter class we may group hair, enamel, and especially the entire nervous system from the brain cell to the terminal modification and end organs constituting the organs of special sense. In class *b* are found sweat, mammary, and sebaceous glands, liver, pancreas, and digestive glands, as well as the thyroid and thymus bodies.

Epithelium covers all surfaces of the body either directly or indirectly connected with the outer world. Although in many cases morphologically similar, epithelium must not be confused with the endothelium which lines the closed cavities (peritoneum, pleura, pericardium, ventricles of the nervous system) and passages (blood and lymph vessels) of the body, and is developed from the middle layer of the blastoderm, Epithelium may be made up of one or many layers (stratified epithelium) of flattened cells joined in irregular margins by a thin cement substance; this form is also called pavement epithelium, and is found in the skin, lips, anus, respiratory tract, and in a modified form composes the hair and nails. Columnar or cylindrical epithelium is composed of elongated cells, prismatic in shape and closely fitted together to form a thickened membrane. This form of epithelium is found on all the mucous surfaces of the body, such as the digestive tract, urethra, vas deferens, as well as

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the ducts leading to secretory glands. Goblet cells are found on mucous surfaces and secrete mucin, but are merely modified epitheliel cells. Ciliated epithelium is provided with minute hairy projections on the free surface of the cells; these cilia are motile and fan adjacent fluids usually in one direction. This form of epithelium is found in the respiratory tract, Fallopian tubes, parts of the testicle, and in the ventricles of the nervous system. Spheroidal or glandular epithelium is made up of spherical or irregularly solid cells found in all the secreting glands and constituting the essential elements of those glands.

In connection with the epithelium we may mention those flattened cells derived from the Mesoblast, called Endothelium, which line the closed cavities of the body, such as the peritoneum, pleura, pericardium, and the blood vessels and lymphatics, the cavities contained in the arachnoid membrane, and in the cavities of the nervous system. The various glands connected with the digestive system are also made up of modified epithelium, distributed for the purpose of performing the secretory function. Such glands, among which we may mention pancreas, liver, salivary glands, and intestinal glands, usually consist of a duct lined with columnar epithelium from which pass off numerous other ducts giving these glands the name of compound racemose glands. At the end of these ducts is found the true secreting epithelium made up of prismatic or cylindrical cells which possess the property of extracting certain ingredients from the blood, incorporating them into their own substance and subsequently giving them off either as excretory products or digestive ferments. Many of these cell layers, such as those contained within the liver, possess the property of holding nutritive substances in reserve and hence are known as storage or Metabolic cells.

Nerve Tissues.—The nervous system is derived from the Epiblast or Ectodermal layer of the embryo. In it we distinguish two histological elements, nerve centers and nerve trunks. Nerve centers are represented by single cells possessing a nucleus, and from which are thrown off one or more trunks which communicate either with nerve fiber or with other nerve cells. These cells are called, from the number of trunks passing through them, unipolar, bipolar, or multipolar, according as they communicate with one or more nerve elements. The cells of the sympathetic nervous system are, as a rule, multipolar. Those found in the cortical layer of the brain possess from one to three communicating trunks. Nerve cells make up the bulk of the material found in the gray matter of the brain and spinal cord, and are also the distinguishing histological element of the various ganglia of the nervous system including the sympathetic ganglia.

The white substance of the brain and spinal cord as well as the fibers found in the peripheral nerve trunks, are of two kinds; (*a*) white or medullated fibers, found principally in the cerebro-spinal system; and (*b*) non-medullated fibers, of a soft gelatinous character and without the well-defined border found in the sympathetic nervous system. Within the brain and spinal cord the nerve fibers are provided with very scanty covering, and lie closely packed, one against another, but in the peripheral nerve trunks the fibers are bound together by a tough fibrous element known as perineurium; each nerve fiber also being contained within a primitive membrane called neurilemma. Within the neurilemma is found a delicate white substance which is called the Medullary Sheath of Schwann, and within this sheath is found the axis cylinder of Remak, which is the only true transmitting nervous element in the entire structure. At the termination of the peripheral nerves are found modifications of the nerve cell which serve either to communicate a motor impulse to the muscles, or a secretory impulse to the glands. These nerve terminations are exceedingly simple and consist usually in a loss of the investing membrane of the nerve fiber and a blending of the fiber itself with the muscle or gland to which the stimulus is to be communicated.

The nerves of touch and special sense are more complicated in their character, especially those found in parts of the body where the sense of touch is most developed. In the fingers, toes, and other very sensitive parts, are found fascicled corpuscles arranged on the nerve fibers like small bunches of grapes or like the enlargement found on certain forms of seaweed. These corpuscles contain the termination of the axis cylinders and preside over the sense of touch. Nerve terminations in the organs of hearing and sight are described in those connections.

From the middle layer of the embryo or mesoderm are derived the bones, muscles, blood, and blood vessels, and much of the genito-urinary system. The principal element from which we may consider all of this structure to have been differentiated is connective tissue. The cells of connective tissue are made up of a small body containing a spherical or ovoidal nucleus with many fibers branching from the body in various directions and interlacing with fibers and other connective tissue cells. Closely allied to the connective tissue cell is the unstriped muscle cell found in the digestive tract, blood vessels, uterus, etc. These cells comprise an elongated body, spindle shaped, with a nucleus elongated and elliptical, to correspond with the body. Each unstriped muscle cell terminates in a small fiber by means of which it interlaces in a certain way with other unstriped muscle fibers. These fibers, however, usually have the same general direction, as opposed to connective tissue in which the cells lie in every conceivable direction. Voluntary or striped muscle fibers are found in the voluntary muscular system, and are made up of parallel bundles collected together into fasciculi, and bound together by a connective tissue substance called perimysium. On ex-

amining voluntary muscle fiber under the microscope it will be seen to be a cylindrical structure about a $\frac{1}{1100}$ of an inch in diameter and marked by transverse striations passing entirely through the muscle bundle. These striations are due to the alternating arrangement of dark and light disks, which on being treated with certain chemical substances, such as hydrochloric acid, will separate from each other. These are known as muscle fiber disks. If, on the other hand, the fibers be treated with strong alcohol for some time, it will tend to separate longitudinally into numerous fibrillæ, all of which display the transverse markings as distinctly as did the large fiber. Each one of the subdivisions of the fibrillæ is called a sarcous element, and it is probable that the alternating distribution of dark and light elements has reference to the development of electrical properties within the muscle fiber. The heart muscle bears a resemblance both to the striped and unstriped muscle fibers. We find in the heart muscle the transverse markings observed in the voluntary muscles, but the fibers do not lie parallel but communicate one with another in an intricate and inseparable manner, so that the most patient teasing is required to separate the single elements.

The supporting framework of the body may be considered to have differentiated itself from connective tissue cell through the medium of cartilage and white fibrous tissue. We find in fibro-cartilage a blending of the connective tissue and cartilaginous elements. Cartilage is divided into three kinds, fibro-cartilage, hyaline, and elastic cartilage. In the fibro-cartilage there are many connective tissue elements and a moderate amount of the homogeneous hyaline-matrix to be found in true cartilage. In hyaline cartilage the connective tissue cells have become few and small and have lost their connecting fibers so that the cell is round or nearly so. With the diminution in the number of connecting fibers there has come to be formed a clear homogeneous matrix within which the cellular elements lie imbedded.

Bone.—Bone is developed either in pre-existing cartilage or in pre-existing membrane thus showing its descent from the simple connective tissue or mesoblastic cell. We may consider that bone is formed by the deposit of calcareous material in cartilage or connective tissue, and that the varying structure, form, and consistency of bone is due to the method by which the chalk is laid down in the connective tissue or cartilage, and by the arrangement of the blood vessels, through which the bone maintains a subsequent existence. Bone is made up of two classes of structure. In one of these forms the bone is deposited in dense, hard layers, hence called compact or vitreous. In the other form the bone is arranged in rounded cavities of varying sizes so that the wall of bone comes to resemble a sponge, and hence is called spongy or cancellated. The outer part of bone is usually composed of this compact tissue, and the interior part is made

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up of spongy tissue which gradually becomes more and more attenuated until the bony element is lost in a central or medullary canal, within which is found the marrow. The blood vessels perforate the bone and nourish it in what is known as Haversian canals, and around these canals are distributed successive layers of chalky substance. Between the layers are found small spaces called *lacunæ* within which are found smaller blood vessels. Connecting the lacunæ and Haversian canal are found small canaliculi. The system of the Haversian canal, with lacunæ and canaliculi is often called the Haversian system. Bone is invested by a tough fibrous substance called the periosteum. Within the medullary canal is found the bone marrow which is divided into two forms, red and yellow. The yellow matter consists mostly of fat cells containing a limited number of blood vessels bound together by connective tissue. The red marrow, on the other hand, which is found usually in the cancellous structure of the bone, contains a large number of so-called myeloid cells which are supposed to be employed largely in certain parts of the blood-making function.

Blood and Blood Vessels.—The blood is differentiated from certain cells found within the mesoblast. It comprises a clear fluid called plasma, rich in salts and albuminoids, and red and white corpuscles. The white corpuscles bear a close resemblance to certain connective tissue cells and are possessed of the power of an amoeboid movement, thus enabling them to work their way through the intercellular substance in the side of the blood vessels to reach the space beyond. It is by these cells that the processes of repair go on in a wound, the white corpuscles gradually changing to granulation tissue and this tissue presently becoming connective tissue. The red corpuscles of man are circular, bi-concave disks about 1-3500 of an inch in diameter and about 1-15000 of an inch in thickness. In contradistinction to the white corpuscles which contain one or more nuclei, the red corpuscles are non-nucleated, and the coloring material which gives them their name is called hæmoglobin, in which iron is a conspicuous ingredient.

The passages within which the blood circulates are composed usually of three coats: 1, the inner coat consists of flattened endothelium deposited on a thin basement membrane and called the *Tunica interior;* 2, a middle coat called *Tunica media*, made up of white fibrous tissue with unstriped muscle fibers disposed in a circular direction, and 3, an outer coat called *Tunica adventitia*, made up mostly of connective tissue. In the aorta the middle and external coats contain a large amount of yellow elastic tissue. In the veins the tunica media is almost entirely lacking, while in the arteries the tunica media and musculor coat is the principal portion of the blood vessel. As the artery becomes arteriole and then capillary it gradually loses its middle and external coat and even the thin basement membrane supporting the endothelial cells. The capillaries consist simply of a fine tube of endothe-

lial cells between which are found minute spaces called stigmata, affording free communication with plasma, lymph and white corpuscles from the interior of the vessels to the adjacent portions of the body.

Kidneys.—The renal organs are developed as filters around small collections of blood vessels which lie in an interlacing network contained within a globular dilatation called the Malpighian capsule. At the upper extremity of the uriniferous tubule each group of blood vessels is supplied by an artery and the blood is carried away by a single vein. It is within this tuft of blood vessels that the watery element of the urinary secretion is strained away. This portion of the secretion is carried from the Malpighian capsule into a twisted tubule which is called the uriniferous tubule. This tube is convoluted and lined with several kinds of epithelium which possess the property of extracting the solid ingredients of the urine from the blood and passing it through into the watery current derived from the Malpighian capsule. The uriniferous tubule terminates in a small opening of one of the papillæ which project into the pelvis of the kidney. The kidney, on dissection, is of a reddish-brown color, and covered by a capsule and peritoneum. The kidney substance is made up of a cortical portion and a medullary portion. The cortical portion is almost homogenous to the naked eye, although there are seen some faint stripes which pass in the direction of the pelvis. The medullary portion, however, is seen to be made up of a number of minute dots from which lead quite distinct stripings terminating on the surface of one of the papillæ projecting into the pelvis of the kidney. The faint dots observed at the outer portion of the medullary part are the Malpighian capsules. The stripings which terminate in the papillæ are the uriniferous tubules. The stripings observed in the cortical portion of the kidneys are found under microscopic examination to be made up of certain portions of the uriniferous tubule which pass out of the cortex and back again before entering the Malpighian capsule or pelvis of the kidney. The passage of blood through the kidneys is modified by the function of the glomerulus and the uriniferous tubule, for the blood on entering the Malpighian capsule does not enter a series of capillaries, but after passing through a ramification of vessels found within the capsule, emerges and passes into a fine series of true capillaries which surround the uriniferous tubule. This system by which the blood passes through two series of small tubes before finally becoming venous, bears a strong resemblance to the circulation through the intestines and liver which we call portal. In the lower animals there is a more distinctly defined renal portal system, but in man this system has become so compressed within the narrow limits of the kidney that it requires the microscope to show that it is homologous with the renal portal system of many of the lower animals.

W. H. Allport.

History is used by Herodotus in the sense which it has since retained, of a narrative of events and circumstances relating to man in his social and civic condition. A record of bare facts by themselves does not constitute history. Such a record (forming a chronicle or annals) is chronologically valuable; but to attain the dignity of history we must have social facts and evolution detailed with considerable fullness, and the growth and movements of society, from one phase to another, distinctly traced and recorded. History depends, however, remotely on contemporary witnesses to the facts related. Written records are not absolutely indispensable, as tradition may supply their place and represent authentic contemporary testimony. But tradition is very insecure and apt to be inventive and oblivious. The field of history is very limited both in time and space in proportion to the length of human existence and the area of the earth's surface occupied by man. Primitive and savage man has no history because the struggle for existence consumed all his energies and he has neither the time nor faculty to think of social events, and even partially civilized mankind is often incapable not only of writing history but of furnishing materials of it. Early history is never critical or painstaking in the investigation of facts. Neither the historian nor his readers or hearers ever reached the stage of culture in which accuracy is highly valued. Early history is essentially artistic. Its object is more to charm the fancy and warm the emotions than to instruct the understanding.

History is of two kinds, the old or artistic type, and the new or sociological type. The artistic type invented by the Greeks remained the ideal of history until comparatively recent times. Its aim was perfection of literary form, weight, and dignity, but no depth of moral and sagacity of political reflection. The new history is to a great extent characterized by opposite qualities. It is pregnant with the notion that society is a great aggregate of force moving according to laws subject to it and similar to those producing evolution and growth analogous to what we see in other forms of life. The old type of history was rather a species of portrait painting which had often every merit except that of a close likeness to the original; but it cannot be denied that the old writers generally thought more of the brilliancy of their colors and the effectiveness of their pictures than of their exact truth.

The ancient historians were indolent in research or rather they did not attach the value that we do to it, but they were large, sympathetic, and humane. The inferior quality of the history of the seventeenth century and the first half of the eighteenth is the more remarkable from the contrast presented by the brilliancy of contemporary literature in other departments. It was written by inferior men from a low point of view, or no point of view at all, and at last it sank to such a degree in the public esteem as to be spoken of in a tone of contempt. The modern school of historians devote much attention to the social life of the people; their method being further characterized by the utmost accuracy of re-

search, the extreme importance assigned to contemporary documentary evidence, and careful weighing of data. The field of history proper is so far restricted as to its subject, that only the doings of a community possessing something of an independent organic life can constitute it. History may be conveniently divided into ancient, mediæval, and modern; but these divisions have little scientific value. The first includes the Jewish history and that of the nations of antiquity, reaching down to the destruction of the Roman Empire, A.D. 476; the second begins with 476 and comes down to the discovery of America in 1492, or to the Reformation; the third section extends from either of these eras to our own times. The earliest written history is found graven on the monuments of Egypt, Assyria, etc. These, though of the barest description, have the value of contemporary chronicles. Next come the histories found in the canonical books of the Old Testament; but the real inventors of the artistic form of history were the Greeks.

Hitchcock, ROSWELL DWIGHT (1817–1887), American theologian. He entered Andover Theological Seminary in 1838, and was successively professor of natural and revealed religion in Bowdoin, of church history at New York, president of the American Palestine Exploration Society, and president of Union Theological Seminary. He visited Italy, Greece, Egypt, and Palestine (1866–69), was the author of a *Life of Edward Robinson*, numerous theological works, hymns, etc.

Hittites, a Canaanitish nation first mentioned in connection with Abraham, who bought the field and cave of Machpelah from them. There are notices of them in Palestine during and after the captivity. Egyptian and Assyrian inscriptions seem to indicate that the nation consisted of a confederacy ruled by a number of chiefs, and at one time there was a Hittite empire extending over a large area in Asia Minor and Syria.

Hoang-ho (or Yellow River), a large river in China, the sources of which are in mountains in the Koko-Nor territory, north from Thibet. In the autumn of 1887 the whole body of the river burst its banks about 300 miles from its mouth, and flooded about one sixth of the province of Ho-nan, destroying towns and villages and causing a loss of life, the lowest estimate of which is one million. Its length is estimated at about 2,600 mi. It derives its name from the vast quantities of yellow earth held in a state of solution by its waters.

Hoar, GEO. F., American statesman, b. in Massachusetts, in 1826. He began the practise of law in 1849; was a member of Congress from 1869 to 1877, when he was elected to the U. S. senate. He was re-elected in 1883, 1889, and 1895.

Hoatzin, a singular gregarious South American bird, referred by some naturalists to the family Curassows. The plumage is brown streaked with white, and the head has a movable crest. It is of the size of a pheasant, and has an enormous crop with a very small gizzard.

Hobart, GARRETT A., b. in New Jersey, in 1844. He graduated at Rutger's College and entered the practise of law in Paterson, N. J. He became interested in several manufacturing companies and railroads. He was a member of the state legislature, both in the house and senate. He was nominated by the Republican National Convention in 1896 for the vice presidency, and was elected in the following November. Died Nov. 21, 1899.

Hobbes, THOMAS (1588–1679), English moral and political philosopher. The most remarkable of his works is his *Leviathan, or the Matter, Form, and Power of a Commonwealth.* In the history of the development of free thought in Europe, Hobbes holds an important place, and he was one of the first great English writers on government. He conceived the state of nature to be one in which all are at war with each other, and government as the result of a compact, suggested by selfishness, for the sake of peace and protection.

Hoboken, Hudson co., N. J., on Hudson River, ¼ mi. w. of New York City. Railroads: D., L. & W.; N. J. Junction Ry.; Erie R. R.; and West Shore. Industries: manufacture of lead pencils, two iron foundries, three paper mills, silk mills, and many other factories. Coal in vicinity. Surrounding country agricultural. The whole tract was purchased from Indians by John Stevens in 1804—consideration, a keg of rum—known then as Hobucken. The Stevens estate to-day comprises two thirds of the city. Became a city in 1855. Pop. 1900, 59,364.

Hobson, RICHMOND PEARSON, was born at Greensboro, Ala., August 17, 1870. He graduated from the United States Naval Academy at Annapolis in 1889, at the head of his class. He became an instructor in naval construction at the Academy and at the opening of the Spanish-American war he went with Admiral Sampson's fleet. After the Spanish squadron was located in the harbor of Santiago Lieutenant Hobson conceived the plan of sinking a ship in the narrow entrance to the harbor and thus prevent the escape of the fleet. With seven companions he took the collier *Merrimac* into the entrance of the harbor Friday morning, June 3, 1898. He succeeded in running the gauntlet of the batteries and sunk the boat in the channel, and with his companions escaped on a raft He was picked up by a Spanish boat and retained as prisoner of war until exchanged a few weeks later. He was highly complimented by Admiral Cervera of the Spanish fleet for his brave deed. At the close of the war he was sent as a naval constructor to the Philippines.

Hoe, RICHARD M. (1812–1886), b. in New York City. He was practically the inventor of the modern printing press, having introduced in 1846 the Hoe Lightning Press. He d. in Italy.

Hoffman, CHARLES FENNO (1806–1884), poet and novelist, b. in N. Y. He edited the *American Monthly Magazine* and the *New York Mirror;* published *Greyslaer*, novel; *The Vigil of Faith and Other Poems;* and a number of songs, etc. During the last thirty years of his life he

was afflicted with mental derangement. A complete edition of his poems was published by his nephew in 1874, with a critical introduction by W. C. Bryant.

Hog, a general name for the ungulate or hoofed animals of the genus *Sus*, or swine. The head is prolonged into a pointed or truncated snout; the feet have four toes, two of which reach the ground; and the skin is very thick, and mostly covered with stiff bristles. The common hog in a tame state is almost universal, except in very high latitudes. The prevailing color of the domestic animal is a dull yellowish white, sometimes marked irregularly with black, and sometimes totally black. It is omnivorous in its habits, devouring almost any vegetable or animal substance. It is also very prolific, has usually two litters in a year, a litter consisting of from ten to even twenty. Its flesh forms a material part of the food of mankind, though Jews are strictly enjoined not to eat it, and Mohammedans agree in this prohibition. Pork takes salt better than almost any other meat, and hence forms an important article in military and naval stores. The lard of the hog is used in a variety of preparations, and the bristles are used in large quantities in the manufacture of brushes, while the skin, when tanned, is used by saddlers, bookbinders, etc. The hog is erroneously looked on as a peculiarly stupid and gluttonous animal; it has also an undeserved reputation for filthy habits, but the too common filthiness of pigsties is more the fault of the owner than the tenant. It wallows in the mire, but this is a peculiarity of all the pachydermata to cool themselves and provide a protection against insects. The wild-boar, from which most of our domesticated varieties are derived, is found in most parts of Europe and Asia. In size the wild animal considerably exceeds the domesticated hog; the legs are longer and more muscular, and the back therefore much higher. Hunting this animal has always been a favorite amusement, and can still be practised in various parts of Europe.

Hogshead, an obsolete measure of capacity containing 63 old wine gals., or 52½ imperial gals. For beer it was 54 gals., for rum 40 to 50 gals., for brandy 45 to 60 gals., and for different kinds. In the U. S. the measure is still in use, being equivalent to 63 American gals. or 52.485 imperial gals.; for tobacco it varies from 750 lbs. in some states to 1,200 lbs. in others.

Hohenlohe (hō′en-lō-e), formerly a principality of Germany, containing 680 sq. mi., now chiefly under the sovereignty of Würtemburg, and partly under that of Bavaria.

Holbein (hol′bīn), Hans (1497–1543) an eminent German painter, b. at Augsburg. He went to England, where letters from his friend Erasmus, whose *Panegyric on Folly* he had illustrated by a series of drawings, procured him the patronage of the chancellor, Sir Thomas More. He was appointed court painter by Henry VIII; and in the Windsor collection has left portraits of all the eminent

Englishmen of the time. The most celebrated of his pictures are the *Madonna* at Darmstadt (better known through the replica at Dresden), representing the Burgomaster Meyer and his wives kneeling to the Virgin; and the *Solothurn Madonna.* His famous *Dance of Death* has only been preserved in the engravings of Lützelburger.

Holberg, Ludwig, Baron (1684–1754), the father of modern Danish literature. His works may be divided into four classes — poems, stage pieces, philosophical treatises, and historical works. His poems are chiefly of a satirical nature. The most celebrated is *Peder Paars*, a comic heroic poem in fourteen cantos, which is still regarded throughout the Scandinavian countries as a masterpiece. His stage pieces are all either comedies or farces, and are nearly all characterized by true comic power. Among his philosophical writings the most important is his *Moral Reflections.* His historical works include *The Political, Ecclesiastical, and Geographical Condition of the Danish Monarchy, A General History of the Jews,* and *A History of Famous Men and Famous Women.*

Holiday, any day set apart as a religious or national festival; in a general sense a day or a number of days during which a person is released from his every-day labors. In the U. S. the holidays are New Year's Day, Washington's Birthday, Good Friday, Decoration Day, the Fourth of July, Labor Day, Thanksgiving Day, and Christmas; but nearly every state has its particular anniversaries or holidays.

Holl, Frank, R. A. (1845–1884), portrait and subject painter, son of Francis Holl, an eminent engraver. He was a very successful student at the Royal Academy, and exhibited constantly from his student days. Among his best-known pictures are *Faces in the Fire, Fern-Gatherers, No Tidings from the Sea, Leaving Home,* and *The Gifts of the Fairies.* Latterly he devoted himself to portraiture, in which he greatly excelled and painted many of the celebrities of the day.

Holland, Josiah G. (1819–1881), American author and editor. In 1844 he graduated at the Berkshire Medical College, but in his practise received but little encouragement. At the age of 30 he connected himself with the Springfield *Republican.* Dr. Holland exhibited remarkable aptitude for journalism, and the paper soon became vastly popular. As a bookmaker many of his works have been very successful, with immense sales. In 1870 Dr. Holland began editing *Scribner's Monthly.* As a lecturer he was very popular.

Holland, Kingdom of. See *Netherlands.*

Holland, North, and Holland South, two provinces of the Netherlands. The greater part of the former consists of a peninsula. Area 1,054 sq. mi. The chief towns are Amsterdam, Alkmaar, Haarlem, Helder, and Zaandam. Pop. 786,116. South Holland, the most populous province of the Netherlands. Area 1,155 sq. mi. Like North Holland, it is a flat and depressed tract. The

principal towns are Delft, Dort, Gorkum, Gouda, Leyden, Rotterdam, Schiedam, Gravenhage. Pop. 911.534.

Holly, a genus of plants embracing a number of evergreen trees or shrubs. The common holly is a handsome, conical evergreen tree, growing to the height of 20 or 30 ft. Its leaves are dark green, shining, and leathery, abundantly armed with prickles on the lower branches, but free from them on the upper, or on very old trees. The flowers are white, appearing in May; the fruit is red, ripening in September, and remaining on the tree all winter. A good many varieties are known, distinguished by the shape and color of the leaves, which are sometimes spotted or edged with yellow, etc. It is excellently adapted for hedges and fences, as it bears clipping. The wood is hard and white, and is employed for turnery work, knife handles, etc. The bark yields a mucilaginous substance, from which birdlime is made. Among the Romans it was customary to send boughs of holly to friends, with new-year's gifts, as emblematic of good wishes; and it is used to decorate houses at Christmas. The American holly is widely diffused throughout the U. S. It sometimes attains the height of 80 ft., with a trunk 4 ft. in diameter.

Branch of Holly; *a.*—flower.

Hollyhock, a biennial plant, a native of China, and is a frequent ornament of gardens. There are many varieties, with single and double flowers, characterized by the tints of yellow, red, purple, and dark purple approaching to black. It reaches a height of 8 ft. or more.

Hollyhock.

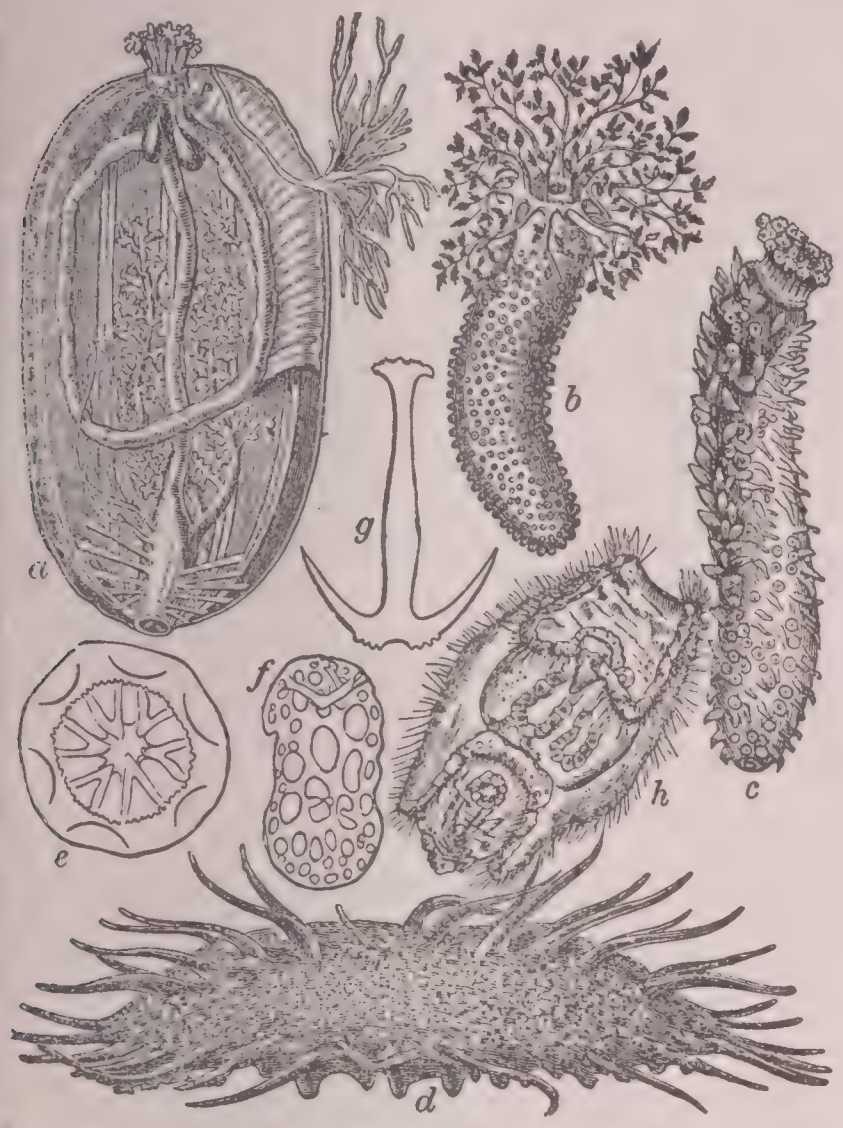
Holman, William S. (1822—1897), b. in Indiana; became a lawyer and held several state judicial offices. In 1856 he was elected to Congress, and, with two or three exceptions, as in 1876 and 1878, retained that position. He was known as "the watchdog of the treasury," and "the great objector," from his invariable opposition to wasteful public expenditures.

Holmes, Oliver Wendell, M. D., LL.D. (1809–1894), a famous author, b. at Cambridge, Mass. He was the son of Rev. Dr. Abiel Holmes, himself a writer. He graduated at Harvard, 1829, after which he began the study of law, but later chose medicine as his profession. In 1832 he went abroad to continue his studies. He obtained his degree of M. D. in 1836, and in 1838 became professor of anatomy and physiology at Dartmouth College. He established himself in Boston in 1840, and in 1847 became professor of anatomy and physiology in the medical school at Harvard. While a student in college be began those humorous productions which indicate the diversity of his talent. On hearing of the proposed breaking up of the frigate *Constitution*, he wrote *Old Ironsides*, which has become national in its fame. The ship was saved at the time, and at last went to pieces on the rocks. He was in sympathy with everything true in nature and genuine in art. *The Autocrat of the Breakfast Table* was first given to the world through the *Atlantic Monthly*. In this work the felicity of expression, in which wit, good humor, and shrewdness are delightfully mingled, charms every one. The results of his physiological and psychological researches are given to the world in some of his stories. *The Poet at the Breakfast Table* ably discusses literature and art. His most popular book is *Every man his Own Boswell.* Dr. Holmes visited Europe in 1886, and was received with great honor. Edinburgh and Cambridge Universities conferred on him the degree of LL.D., and Oxford that of D.C.L. Dr. Holmes's reputation rests on a solid basis of achievement. He was a skilled physician, a charming lecturer, a poet, a philosopher, a wit, and a man of letters, all combined.

Holothuria, the type of an order of Echinoderms, the sea cucumbers. This order is destitute of the calcareous plates typical of the class, but has a leathery integument open at both ends, and pierced by orifices through which suctorial feet or ambulacra protrude. They have the mouth surrounded by tentacula; a long convoluted alimentary canal; respiratory organs near the anus, and generally in the form of two branching arborescent tubes (forming the "respiratory tree") into which the water is admitted; and the organs of both sexes in each individual. They are capable of extending themselves to several times the length they have in a state of repose, and of extraordinary reproduction of parts, even of vital organs. The young undergo a metamorphosis during development. They abound in the Asiatic seas, the *bêche-de-mer* or trepang being a member of the family.

Holst, Hermann Eduard von, historian, b. at Livonia in 1841. He was educated at Heidelberg and emigrated to the U. S. He was made professor at Strasburg University in 1872, and later was professor of modern his-

tory at Freiburg. Returning to the U. S. he lectured upon history at Johns Hopkins University, and in 1892 he was made head professor of history at the University of Chicago. His principal books are, *Constitutional and Political History of the U. S.; Life of John C. Calhoun*, and *Constitutional Law of the U. S. A.*



a.—Semidigramatic view of the viscera of a Holothurian. Projecting from the upper end are the tentacles, lower down the calcareous ring, and still lower in the middle line the two Polian vesicles. The intestine is shown, passing in a loop to the binder end of the body. Longitudinal muscles pass from the anterior to the posterior end of the animal. To the right is the branched genital gland with its duct.
b.—*Phyllophorus urna*, ⅓ nat. size; *c.*—*Holothuria tubulosa; d.*—*Oneirophanta mutabilis*, ⅓ nat. size; *e.*—calcareous wheel, from the integument of *Chirodota purpurea*, magnified 100 diameters; *f, g.*—plate and anchor of *Synapta Beselii*, highly magnified; *h.*—larval form of *Holothuria tubulosa*, highly magnified.

Holy Alliance, a league concluded at Paris, Sept. 26, 1815, between Alexander I, emperor of Russia, Francis of Austria, and Frederick William III, of Prussia, and signed with their own hands, and without the countersign of a minister. It consisted of a declaration, that, in accordance with the precepts of the gospel of Jesus Christ, the principles of justice, charity and peace should be the basis of their internal administration, and of their international relations, and that the happiness and religious welfare of their subjects should be their great object. Its real aim, however, was to maintain the power and influence of the existing dynasties. The events of 1848 broke up the Holy Alliance.

Holyhead, an island and seaport town of North Wales, in the county of Anglesey. The

island is about 7 mi. long and 5 mi. broad at the widest part, is situated off the west side of Anglesey, and is connected with the mainland by a causeway. The town is on the northeast side of the island, and owes its prosperity to the railway and steamboat traffic between England and Dublin.

Holyoke, Hampden co., Mass., on Connecticut River, 8 mi. n. of Springfield. Railroad: N. Y. N. H. & H. A dam across the river furnishes fine water power. This city produces the largest amount of fine writing paper and envelopes in the U. S., employing over 4,000 people. It has also large blank-book works, and manufactures cotton and woolen goods, cutlery, machinery, screws, alpaca, rubber, and imitation seal skin. It has wire, planing, and flouring mills and brass foundries. Pop. 1900, 45,712.

Holy Spirit Plant, an orchidaceous plant of Central America, known also as the *dove-plant*, from the resemblance of the united stamens and pistil of the flower to a dove hovering with expanded wings, somewhat like the conventional dove seen in artistic representations of the Holy Ghost. It has a spike of almost globose, sweet-scented flowers of a creamy white, dotted with lilac on the base of the lip.

Homage, in feudal law, a formal acknowledgment made by a feudal tenant to and in presence of his lord on receiving the investiture of a fief or coming to it by succession, that he was his vassal. The tenant, being ungirt and uncovered, kneeled and held up both his hands between those of the lord, who sat before him, and there professed that "he did become his man, from that day forth, of life and limb, and earthly honor," and then received a kiss from his lord.

Homer.—The earliest named Greek poet, to whom ancient tradition assigned the authorship of the *Iliad* and *Odyssey*. Of Homer's life and personality nothing is known, and it has been questioned whether such a person ever existed. Several ancient "*Lives of Homer*" are preserved, two of which are stated by their titles to have been written by Herodotus and Plutarch. It is certain, however, that the statements of authorship are false, and the biographies are valuable only because they show what was the ancient popular tradition concerning the poet. Many towns claimed the honor of being his birthplace, and the names of seven are preserved in an epigram. Of these Smyrna seems to have had the strongest claim, Chios coming next. At the latter town was a clan of bards called Homeridæ, who transmitted the epics from father to son and claimed Homer as their founder. In one of the *Homeric Hymns*—poems addressed to the gods and because of their similarity in style ascribed to Homer, but probably for the most part of later date—the author describes himself as the "blind bard of rocky Chios." The tradition of Homer's blindness was universally accepted. Ancient writers mention the name as a pseudonym of the poet, and various interpretations of it are given, the two most probable being

that it meant "Hostage," or "one who puts together," the latter giving color to the theory that Homer was not an original poet, but merely a compiler of current lays. The general belief of antiquity seems to have been that Homer was b. in Smyrna, lived some time in Chios, and was buried in Ios. The date of Homer has been variously placed between the beginning of the twelfth century and the beginning of the seventh century B. C. While it cannot be located with any certainty, it probably belongs between 800 and 700 B. C., that is 400–500 years after the Trojan War. The dialect and a few local allusions indicate that the *Iliad* and *Odyssey* originated on the Ionian coast of Asia Minor and the Ægean Islands. Lycurgus is said to have brought them to Sparta (c. 776 B. C.), and we hear of their recitation by rhapsodists about 600 B. C. Solon regulated their recitation at Athens, and the Tyrant Pisistratus (560–527) had them edited by a commission and arranged in what is practically their present form. Perhaps the lays, or "rhapsodies" had previously been sung separately and were then for the first time united into two poems, the *Iliad* and *Odyssey*. Other poems of the epic cycle had been attributed to Homer, but the critics rejected all except the *Iliad* and *Odyssey*, which were considered as genuine and as the work of one author by all but a small minority, called Separatists. Their arguments were refuted by the Alexandrian School and no further objection as to genuineness or unity of authorship was raised until 1795. The frequent allusions and quotations in Greek literature prove the high estimation in which the *Iliad* and *Odyssey* were held by the Greeks themselves. Every city of importance had its civic edition, from which copies could be made for private individuals. A famous edition was that prepared by Aristotle for his pupil, Alexander the Great.

During the Alexandrian period (300–146 B. C.) of Greek literature, the Homeric poems were carefully studied and edited. The chief of the Homeric critics at Alexandria were Zenodotus, Aristophanes, and Aristarchus. To the last of these are ascribed the division of the *Iliad* and *Odyssey* into twenty-four books each, and the use of large and small letters of the Greek alphabet to designate these books. The "scholia," or critical notes, were inserted in the MSS. by later grammarians, and were probably originally the notes taken by students who listened to the lectures of the Alexandrian critics. In 1788 was published the oldest and last manuscript of the *Iliad* in existence, called the *Codex Vinetux A*, because of its discovery in the library of St. Mark's at Venice. From the scholia of this MS. it was evident that the Alexandrian critics had no accepted complete text of the *Iliad* before them, but relied on the civic editions, the earliest of which was not older than 450 B.C. The earliest historical mention is in the time of Pisistratus (560–527), so the question arose as to how the poem had been preserved unaltered since the days of Homer,

centuries before. This also called forth, in 1795, the famous *Prolegomena* of F. A. Wolf, which speedily divided the world of scholars into two hostile camps, between whom the controversy has raged ever since. The Wolfian theory is of great importance, as its principles affect the credibility of all early literature and history. This "destructive criticism," as it is called, has been applied to other national epics, as the German *Nibelungenlied*, and similarly to the Holy Scriptures. Briefly stated, the arguments of Wolf and the answers of opposing critics, are as follows: The poems are too extensive to be composed or transmitted without the art of writing. There is evidence that the poems were intended to be heard, not read, and in them may be found proof that writing was not in vogue at the time of their composition, not having come into use before the time of Pisistratus. Hence Wolf concludes the poems originated in lays sung by bards at the popular festivals, at first separate and unconnected, and only combined in the time of Pisistratus. This would explain the numerous birthplaces ascribed to Homer, this being not the name of a poet, but of a style of composition which flourished in various places. To this it has been answered that the *Iliad* and *Odyssey* might have been composed without the art of writing, even if it be certain that this was not known to Greece until Pisistratus, for long poems have been so composed and preserved by oral transmission; so were the Icelandic scaldic lays for over two hundred years. Moreover, the memorizing and correct transmission of so long a poem is by no means an incredible feat. Secondly, the poet would have no object to compose such a long work for mere recitation, as only small portions could be heard at banquets and festivals. But we know that at the great national festivals sometimes as many as fifteen dramas in succession were patiently, even eagerly, listened to. Replying to the argument that the poems did not exist as a whole before Pisistratus, it is shown that an *Iliad* did exist before 776, and that Solon's regulations presuppose the poems in a definite form. Pisistratus simply restored and fixed their form, and did not create it. Wolf further agrees that both *Iliad* and *Odyssey* show inconsistencies and lack of unity, interpolations and evidences of piecing. Many critics, however, find a marvelous unity of structure, especially consistency in characters, and find no variations of importance, only the discrepancies which are common to all great poems where the central thought is of more account to the poet than insignificant details. Homer, they say, doubtless drew his materials from tradition and existing songs, but the harmonious combination into an epic is the work of a single master genius. Working on Wolf's theory, Lachmann detected eighteen independent lays in the *Iliad* by different authors, which were long transmitted by the Homeridæ and other poetic guilds. The *Odyssey* has been similarly examined and

divided into two original epics. The following conclusions may now be accepted respecting the Homeric poems and their authorship. Homer was one of a fraternity of bards who went from place to place reciting heroic lays. These had been developed from earlier war songs, and this school of poetry had now reached its highest point. Like the later minstrels and troubadours, the bards sometimes improvised or varied their songs. Homer, more gifted than the rest, composed a longer heroic poem, which became a great favorite, and because of the popular demand, was sung by other bards after his death. His fame constantly grew, and at length inquiries were made concerning his life. Homer had, perhaps, remained an obscure, wandering minstrel, possibly poor and blind, and nothing definite could be learned about him, so fables and varying accounts arose to satisfy the demand for information. The nucleus of the *Iliad* is a single work of considerable extent by one poet on the *Wrath of Achilles*, in which there was a single central motive. This was composed about 940 B.C. The bards, in consequence of the popularity of Homer's poem, devoted themselves to enlarging and perfecting the original work, grouping about it suitable episodes, and probably committing the whole to writing, which was then called the *Iliad*, because the events centered about the siege of Troy, or Ilium. The bards came to be called "rhapsodists," the Greek word meaning "one who strings or joins songs together. The *Odyssey* was certainly composed later than the *Iliad*. It may have been the work of Homer in his old age, but some place it as much as two centuries later. It is distinguished by a loss of creative power, but by increase of orderly arrangement. The poem is one of many epics, being the only surviving example, describing the return of Greek heroes from the Trojan War, and the original *Odyssey* included only the portions relating to the wanderings of Odysseus.

Iliad, The, contains 15,681 lines, and describes an episode covering about 40 days in the 10 years' siege of Troy by the Greeks. In order to understand the *Iliad*, the facts leading up to it, some of which are mentioned in the poem, must be known. The Trojan Paris had carried off the fairest woman in Greece,—Helen, wife of Menelaus, king of Sparta. She had been given to Paris by the goddess Venus (Gk. Aphrodite) as a reward for his having decided in her favor the triangular contest of beauty between herself, Minerva (Athene), and Juno (Hera). To recover Helen and avenge the wrong, the Greeks under command of Agamemnon, king of Mycenæ, and brother of Menelaus, had set sail in 1,100 ships to besiege Troy. Ten years they besieged the city without result, for the Trojans would not venture forth to combat on account of their dread of the famous hero, Achilles. Finally Achilles suffered insult from Agamemnon, who took from him the captive maiden, Briseis, who had been assigned to him after the sack of a small outlying town. Achilles left the conflict and withdrew to his

tent by the seashore. This is the point at which the *Iliad* begins, and much of the poem is devoted to the *Wrath of Achilles* its causes, effects, and how it was appeased. The Trojans now come forth to meet the Greeks, and 15 of the 24 books tell the varying fortunes of the conflict. Finally in Book XVI, Patroclus begs Achilles to lend him his armor, and with it goes into battle. The Trojans believe they see Achilles, and flee in terror, but at length Patroclus is afflicted with a stupor by Apollo, and is slain by Hector. To avenge his friend, Achilles returns to the combat, with a new suit of armor given him from Vulcan. He slays Hector and drags his body to the ships. In the last book King Priam begs of Achilles his son's body, and during a truce Hector is buried with fitting rites. The struggle is watched by the gods throughout the poem, Mars and Apollo aiding the Trojans; Juno, Minerva and the other deities the Greeks. Several famous single combats occur, as between Paris and Menelaus in Book III, Hector and Ajax in Book VII, Æneas and Achilles in Book XX.

Odyssey, The, describes in 12,205 lines the return of Odysseus, or Ulysses, one of the Greek heroes, from the Trojan War. At the beginning of his voyage he is wrecked on the coast of Thrace, and in plundering the town of Ismarus, he loses many of his followers. Next he was driven to the coast of Libya, and thence northward to the goat island. With one ship he sailed to the island of the Cyclops, on the west coast of Sicily. O. and twelve companions entered the cave of the one-eyed monster, Polyphemus, who devoured six of the intruders. O. makes Polyphemus drunk with wine, blinds him with a burning pole and escapes with his comrades. Henceforth O. was pursued by the wrath of Poseidon (Neptune), whose son, the Cyclops, he had blinded. After losing all his ships but one, he reaches an island where dwells the sorceress Circe, who counsels him to make a journey to Hades. After that, he sailed by the island of the Sirens, and after successfully passing Scylla and Charybdis, reaches Thrinacia, the island of Helios. Here his companions killed some sacred oxen and consequently on their next voyage were all shipwrecked and drowned. Odysseus escaped to the island where lived the nymph, Calypso, and remained there eight years. Leaving here on a raft he was again wrecked, but reached Scheria, the island of the Phæacians. The princess Nausicaa and her maidens discover him, and he is kindly received and cared for by King Alcinous. After a happy sojourn (most charmingly described), he is sent to Ithaca, and after slaying the suitors of his wife Penelope, is gladly welcomed by her and all his subjects. The best verse translations of the Homeric poems are Bryant's *Iliad* and Chapman's *Odyssey*.

Home Rule, in British politics, a measure which has been more especially advocated in regard to Ireland. The leading feature of the Irish Home Rule party seems to be the establishment of a native parliament in Ireland to conduct all local and internal legislation, leav-

ing the general political government of the empire to an imperial parliament. The movement originated in the formation of the Home Government Association at Dublin, in 1870, under the presidency of Isaac Butt. At the general election of 1874 the party succeeded in sending 60 Home Rule members to Parliament for Irish constituencies. The elections of 1885 and 1886 still further strengthened the party, 86 members following the lead of Mr. Parnell. The original scheme has been materially modified since Butt's time, and there are not wanting Irishmen who declare openly for absolute independence, which many believe to be the ultimate aim of the whole party. The conversion of Mr. Gladstone and many members of the Liberal party to Home Rule principles has added immense strength to the movement.

Homestead, Allegheny co., Pa., a suburb of Pittsburg, 6½ mi. s.e. of the city. Extensive coal mines in vicinity. Railroads: Pennsylvania; P. & L. E. Principal industries are mining, steel works, steel plate mill, etc. Pop. 1900, 12,554.

Homilet'ics, the art of preaching; that branch of practical theology which teaches the principles of adapting the discourses of the pulpit to the spiritual benefit of the hearers, and the best methods which ministers of the gospel should pursue for instructing their hearers by their doctrines and example.

Homœop'athy, the name of a system of medicine introduced by Samuel Hahnemann of Leipsic. It is a system founded upon the belief that drugs have the power of curing morbid conditions similar to those they have the power to excite, an old belief long ago expressed in the Latin phrase, *similia similibus curantur* (like is cured by like). In contradistinction to this system the more common method of treating diseases has been termed *heteropathy* or *allopathy*. In practice homœopathy is associated with the system of administering infinitesimal doses.

Honan', a once populous city of China, in the province of same name, on an affluent of the Hoang-ho. The province has an area of 65,104 sq. mi.; capital Kai-fung; pop. of the prov. 22,117,036.

Hondo, the name given by the Japanese to the chief island in their empire. In many geographical works Nippon, or Niphon, is the distinctive appellation of this island, but by the Japanese themselves that name is applied to the whole country. The area of the island is 87,425 sq. mi., and the pop. 29,317,000.

Hondu'ras, a republican state of Central America; area 46,400 sq. mi. Its mineral wealth is very considerable, and includes gold, silver, lead, and copper. There are extensive forests abounding in fine timber. The principal cultivated productions are maize, beans, some wheat, rice, plantains, and tobacco. Since 1880 the capital has been Tegucigalpa, the principal ports are Truxillo on the Caribbean Sea, and Port San Lorenzo, in the Pacific. The constitution of the state gives the legislative power to a congress of deputies composed of thirty-seven members. The executive

authority is in the hands of the president. Pop. 431,917.

Honduras, Bay of, a wide inlet of the Caribbean Sea, having on the s. Guatemala and Honduras, and on the w. British Honduras and Yucatan. Along its shores are the islands of Bonaca, Ruatan, Utila, Turneff, and numerous islets and reefs called cays.

Honey, a vegetable product, with saccharine properties, collected by bees from the blossoms of flowers, and deposited in the cells of their combs. The best is clear and transparent, and solidifies when kept for some time into a granular, white mass. Some varieties of it are dark yellow or brownish in color. Spring honey is more esteemed than summer honey; and the latter more than that of autumn. *Virgin* honey is taken from hives in which the bees have never swarmed, and it is of a white color. *Yellow* honey is extracted from all sorts of combs. The flavor of honey largely depends on the plants from which it is collected. Honey is obtained in large quantities in many countries, partly from wild bees, but chiefly from those kept in hives. In addition to its ordinary domestic uses, it is employed medicinally as a promoter of expectoration, to sweeten certain medicines, to make a gargle with vinegar, etc. It is also used in making mead. The ancients used it as we do sugar, and made of it and wine a mixture very much liked.

Honey Ant, an ant inhabiting Mexico, and living in communities in subterranean galleries. In summer a certain number of these insects secrete a kind of honey in their abdomens which become so distended as to appear like small pellucid grapes. Later in the season when food is scarce these ants are devoured by the others, and they are also dug up and eaten by the inhabitants of the country.

Honeycomb, a waxen cellular structure framed by the bees to deposit their honey and eggs in. The wax is secreted by the insect in the form of small and thin oval scales in the folds of the abdomen. The comb is composed of a number of cells, most of them exactly hexagonal and arranged in two layers placed end to end, the openings of the layers being in opposite directions. The comb is placed vertically, the cells being therefore horizontal. The sides of the cells are very thin, and yet the whole structure is of considerable strength. Some cells are destined for the exclusive reception of honey, others for the reception of larvæ.

Honey Eater, the name given to a number of incessorial birds forming the family Meliphagidæ, of the tribe Tenuirostres. They form a numerous group, feeding principally on honey and the nectar of flowers. They are natives of Australia and the adjacent islands. They have long, curved, sharp bills, with tongues terminating in a pencil of delicate filaments, to enable them the better to extract the juices of flowers.

Honey Locust (Sweet Locust, or Black Locust), a forest tree belonging to the U. S. The leaves are pinnated, divided into numer-

ous small leaflets, and the foliage has a light and elegant appearance; the flowers are greenish, and are succeeded by long, often twisted pods, containing large, brown seeds, enveloped in a sweet pulp. This tree is especially remarkable for its formidable thorns, on which account it has been recommended for hedges. A tree resembling the last in general appearance grows in swamps in Illinois and southwestward. The wood is inferior in quality.

New Holland Honey Eater.

Honeysuckle (or Woodbine), genus *Lonicēra*, of Linnæus, nat. order Caprifoliaceæ, The common honeysuckle, a twining shrub, with distinct leaves, and red berries, is indigenous in Great Britain; but two others have been naturalized, *L. caprifolium*, distinguished by its upper leaves being united in a cup; and *L.*

Honeysuckle. *a.*— flower; *b.*— fruit.

xylosteum, with small, yellowish, scentless flowers, and scarlet berries. Trumpet honeysuckle is also cultivated in Britain on account of the beauty of its flowers. The honeysuckle family is represented in North America by nine different species. *Australian honeysuckle* is a name given to *Banksia australis* and other species of the Protea family, from their flowers being filled with a sweet liquid.

Hong-Kong, an island off the s.e. coast of

China, belonging to the British, at the mouth of the estuary that leads to Canton, from which it is distant 75 mi. Area 32 sq. mi. The island consists almost entirely of barren rocks, which rise to heights of 1,000 to 2,000 ft., and is almost destitute of vegetation. Good water, however, is abundant. On the north side of the island, on a splendid harbor, is Victoria, the chief town of the island and center of its commerce. It is well laid out with handsome streets, and has a cathedral, a bishop's palace, a government house, court house, etc.; while handsome residences of the merchants are scattered about the town and its suburbs. Hong-Kong is a great entrepôt for the foreign commerce of China, and is a free port without customs dues. The prosperity of the colony is chiefly owing to the presence of large numbers of Chinese, engaged in trade or in working the building stone, which is one of the principal products of the island. Pop. est. 1898, 248,710.

Honolu'lu, the capital of the Hawaiian Islands, south side of the island of Oahu,. Its most notable edifices are the palace, the Roman Catholic Cathedral, the treasury, the parliament house, etc. There is a fine natural harbor. Honolulu is a rapidly improving place. Pop. 1900, 39,306.

Honorius, Flavius (384–423), Roman emperor, son of Theodosius the Great. After the division of the empire, A. D. 395, Honorius received the western half, but, on account of his youth, Stilicho was appointed his guardian. The principal events of his reign are the adoption of rigorous measures against paganism in 399; the invasion by Alaric in 400–403; another irruption of barbarians under Rhadagaisus, 405–406.

Hood, Robin (1160–1247), a celebrated outlaw, who, according to the popular account, with his followers, inhabited Sherwood Forest, in Nottinghamshire, and also the woodlands of Barnsdale, in the adjoining West Riding. They supported themselves by levying toll on the wealthy, and more especially on ecclesiastics, and by hunting the deer of the forest. The principal members of his band were his lieutenant Little John, his chaplain Friar Tuck, William Scadlock, George-a-Greene, Much, the miller's son, and Maid Marian.

Hood, Thomas (1798–1845), an English poet and humorist. During a residence at Dundee, and while only fifteen or sixteen years of age, he contributed articles to a local paper and magazine. In 1812 he became sub-editor of the *London Magazine*, and in 1826 appeared his *Whims and Oddities*, which was followed by *National Tales* and a volume of serious poetry. From 1829 to 1837 he conducted his *Comic Annual*. At the same time his pen was employed on other subjects, and he published *The Epping Hunt*, a comic poem. In 1837, on the termination of the *Comic Annual*, he commenced a monthly periodical entitled *Hood's Own*, which consisted chiefly of selections from the former work. In 1839 he published his *Up the Rhine* which, based on the lines of *Humphry*

Clinker, was very popular. It was during his last illness that he contributed to *Punch*, *The Song of a Shirt*, *The Bridge of Sighs*, and *The Lay of the Laborer*. Hood is unrivaled as a punster, and he possesses a singular power of combining the humorous with the pathetic.

Hooded Seal, a species of seal, the male of which possesses a movable, inflatable muscular bag, stretching from the muzzle to about five inches behind the eyes. The prevailing color is bluish black—the head and limbs being uniformly black. Its usual range extends in America southward to Newfoundland, and in Europe to Southern Norway.

Hooke, ROBERT (1635–1703), an English mathematician and natural philosopher. In 1658–59 he invented the balance spring of watches, an honor otherwise ascribed to Huyghens; in 1664 he became Cutlerian professor of mechanics to the Royal Society, and in 1664 professor of geometry at Gresham College. He partially anticipated the Newtonian theory of gravitation and the undulatory theory of light, and invented or materially improved many scientific and mechanical instruments.

Hooker, JOSEPH (1814–1879), American soldier, graduated at West Point in 1837, served against the Seminoles and in the Mexican War. He accompanied the army from Vera Cruz to Mexico City and was breveted major. At Chapultepec he was breveted lieutenant colonel. He was engaged at the siege of Yorktown, and on the day after its evacuation was appointed a major general of volunteers. Later he became division commander in the army of Gen. Pope, Virginia. On the failure of Gen. Pope to advance against the enemy, the army of the Potomac was again led by Gen. McClellan, and Gen. Hooker took command of the first corps. He was shot through the foot, and soon afterward was appointed brigadier general in the regular army. He was mustered out of service and placed on the retired list 1868, with the full rank of major general.

Hoop Ash, an American tree found in the forests of Ohio and in the Western States. It is a fine tree, attains a height of 80 ft., and is employed for charcoal. Its fruit is round, and in size nearly equal to a pea.

Hoopoe, a bird forming the type of a family generally classed with the bee eaters or the honey-eaters, but also with the hornbills. The European hoopoe is about 12 in. long: it has a fine crest of pale cinnamon-red feathers, tipped with black; upper surface on the whole ashy brown; wings black, the coverts having white bars; throat and breast pale fawn; abdomen white, with black streaks and dashes. It has a very wide range, from Burmah to the British Islands and Africa. It is a ground feeder, preying chiefly on insects, and seems to delight in filth; it nests in cavities of trees or walls, and its eggs vary from four to seven. The hoopoe utters a loud double or treble *whoop*, whence its name.

Hoosac Tunnel, the longest railway tunnel in America, in the western part of Massachusetts, on the railway from Boston to Troy,

N. Y. It pierces the Hoosac Mountain, the summit range extending southward through Massachusetts from the Green Mountains of Vermont. It is 4¾ mi. long and has a double line of rails.

Hoosic Falls, Rensselaer co., N. Y., 27 mi. n.e. of Troy, on the Hudson River and Boston Hoosac Tunnel. Railroad, Fitchburgh. Industries: reapers and mowing machines, malleable iron, shirts and woolen goods, foundries, steam saw mill, etc. Pop. 1900, 5,671.

Common Hoopoe.

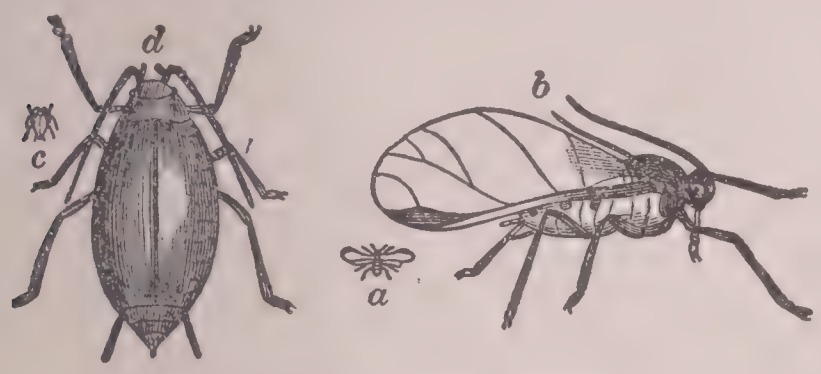
Hop, a plant of the hemp family, a native of Europe, and perhaps of the U. S., where it occurs wild. The root is perennial, giving out several herbaceous, rough, twining stems, with large lobed leaves; the fertile flowers are green; the fruit is a catkin, and the plant is

Hop.

cultivated for the sake of the catkins, which are employed to communicate to beer its

aromatic bitter. The young shoots are sometimes boiled and eaten like asparagus; the fibers of the old stems make good cords. The cultivation of the hop is more carefully attended to in England than in any other country, Kent being the chief county in which it is grown; but the plant is also extensively reared in other parts of Europe, as also in North America, Australia, New Zealand, etc. The use of the hop catkins depends upon a peculiar bitter substance which they contain, called *lupulin*, which is a yellow powder, containing a bitter principle and a volatile oil. The lupulin constitutes from 10 to 12 per cent. by weight of the catkin, and the bitter principle forms from 8 to 12 per cent. of the lupulin. Having tonic, stomachic, and narcotic properties, hops are often used medicinally. Pillows stuffed with hops are used to induce sleep.

Hop Fly, a species of plant louse very destructive to the hop. The winged female is green with a black head and bands and spots of black on the body; the legs and wings are long. A few winged females make their first appearance about the middle of May, and



Hop Aphis (*Aphis humuli*).

a, b.—winged female, natural size and magnified; *c, d.*—larva or "nit," natural size and magnified (from Miss Omerod).

wingless myriads by the middle of June. The insects suck the under side of the upper leaflets, and there deposit their young on the most succulent part of the plant. Myriads perish by means of lady birds and other insects.

Hopkinson, Francis (1737–1791), a signer of the Declaration of Independence, was b. in Philadelphia. He was admitted to the bar in 1761. In 1776 he was delegate to the Continental Congress. During the war for independence his patriotic writings powerfully influenced public sentiment.

Hopkinsville, Christian co., Ky., on Little River, 74 mi. s. of Henderson. Railroad, Louisville & Nashville. Wheat and tobacco are extensively grown in the district. Coal, iron, and timber are abundant, and it is a rich agricultural region. Industries: flour and planing mills, coach and plow factories, etc. Pop. 1900, 7,280.

Horatius Flaccus, Quintus (b. c. 65–8), commonly known as Horace, the greatest of Latin lyric poets, was b. near Venusia, in Southern Italy. When Horace was about twelve years of age his father removed with him to Rome, where he received an excellent education. At the age of eighteen he went to Athens to complete his studies. After the

assassination of Julius Cæsar, Brutus came to Athens, and Horace, along with other Roman youths, joined his army. He was appointed to a military tribuneship, was present at Philippi, and on the defeat of Brutus saved himself by flight. On the proclamation of an amnesty to the vanquished, Horace returned to Italy, but found his father dead, his paternal estate confiscated, and himself reduced to poverty. He was, however, enabled to purchase a clerkship in the quæstor's office, which enabled him to subsist frugally and to cultivate his poetical talent. His poems procured him the friendship of Vergil and Varius, and to them he was indebted for his first acquaintance with Mæcenus, who was the friend and confidant of Augustus Cæsar, and who expended his wealth for the encouragement of literature and the arts. Mæcenas received Horace among his intimate friends, and, after some years, presented him with a small estate or farm in the Sabine country about 15 mi. from Tibur (Tivoli), which was sufficient to maintain him in ease and comfort during the rest of his life. He had also a cottage at Tibur, and at Rome or one or other of these country residences the latter part of his life was spent. Although he was ultimately introduced to Augustus he never sought favors from him, and he is said to have declined an offer of the management of his private correspondence. His works consist of four books of odes; a book of epodes or short poems; two books of satires; and two books of epistles, one of which is often cited as a separate work, under the title of *Ars Poetica*. The lyrics of Horace are largely based on Greek models, but the exquisite beauty of his language is all his own. It is, however, in his satires and epistles that he shows the greatest power and originality, wit and humor, gravity and gaiety, shrewdness and common sense, tender sentiment, and at times melancholy. His writings have been often translated, and into many languages. In English Pope and Swift have given free imitations of various parts of his writings.

Common Horehound.

Horehound, a labiate plant, with whitish, downy leaves and stem; flowers small, nearly white, in crowded whorls, possessing an aromatic smell and bitter flavor. It is a popular remedy for coughs and colds, usually as an infusion. It is a native of Britain and Europe generally. Black horehound (*Ballōta nigra*), also a labiate plant, is a malodorous and unattractive weed. Horehound is domesticated in the U. S.

Horn, a general term applied to all hard and

pointed appendages of the head, as in deer, cattle, etc., but as a term denoting a particular kind of substance nothing should be called horn which is not derived from the epidermis, or outer layer of the integument, whether on the trunk, hoofs, or head. Horn is a tough, flexible, semitransparent substance, most liberally developed in the horns of bovine animals, but also found in connection with the "shell" of the tortoise, the nails, claws, and hoofs of animals, the beak of bird and turtle, etc. Horn is softened very completely by heat, so as to become readily flexible, and to adhere to other pieces similarly softened. True horn consists principally of an albuminoid principle, *keratin*, with a small portion of gelatin and a little phosphate of lime. In some species of animals the males only have horns, as for instance the stag. In cattle both male and female have horns, though there are also hornless cattle. Horns differ widely in the case of different animals. Thus the horns of deer consist of bone, and are deciduous; those of the giraffe are independent bones, with a covering of hairy skin; those of oxen, sheep, and antelopes consist of a bony core covered by a horny sheath. The horns of the rhinoceros alone consist exclusively of horny matter. The horns of oxen, sheep, goats, and antelopes are never shed, except in the case of the prong-horned antelope. The number never normally exceeds four, and in the case of deer the horns are branched.

The various kinds of horns are employed for many purposes. The principal ones used in the arts are those of the ox, buffalo, sheep, and goat. Deer horns are almost exclusively employed for the handles of knives and of sticks and umbrellas. Those which furnish true horn can be softened by heat (usually in boiling water), cut into sheets of various thickness, which sheets may be soldered or welded together at the edges so as to form plates of large dimensions, and polished and dyed so as to imitate the much more expensive tortoise shell. The clippings of horn may be welded together in the same manner, and made into snuff-boxes, powder-horns, handles for umbrellas, knives, forks, etc. As horn has the valuable property of taking on and retaining a sharp impression from a die, many highly ornamental articles may be turned out. Combs for the hair are made from the flattened sheets, and out of the solid parts of buffalo horns beautiful carvings are made.

Horn, a musical instrument, originally formed, as the name denotes, from the horn of an animal. The name includes a large family of wind instruments, many of which have fallen into disuse. The French horn, or simply *the horn*, consists of a metallic tube of about 10 ft. in length, very narrow at top, bent into rings, and gradually widening toward the end whence the sound issues, called the *bell*. It is blown through a cup-shaped mouthpiece of brass or silver, and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the bell of the instrument. As a simple tube, unprovided

with holes, the horn yields only the generating note, and of course would be confined to one key; but by means of *crooks* the tube can be lengthened, and transposed into any key. By inserting the hand into the bell, which flattens a note, the sounds wanting are produced. The compass of the instrument is three octaves. Music for the horn is always written in the key of C, an octave higher than it is played, with the key of the composition marked at the beginning of each movement; thus "corni (or horns) in D" directs the performer which crook he must use to play the notes in the key indicated. The bugle, cornet-a-piston, and saxhorn are allied instruments.

Hornbeam, a small bushy tree common in Britain, and often used in hedges, as it stands cutting and in age becomes very stiff. The wood is white, tough, and hard, and is used in turnery, for cogs of wheels, etc. The inner

Common Hornbeam.
a.—male catkin; *b.*—female catkin, fully developed; *c.*—fruit.

bark yields a yellow dye. The American hornbeam is a small tree sparingly diffused over the whole of the U. S. The wood is fine-grained, tenacious, and very compact.

Hornbills, a remarkable group of birds confined to Southern Asia and Africa, akin to the kingfishers and toucans, remarkable for the very large size of the bill, and for an extraordinary horny protuberance by which it is surmounted, nearly as large as the bill itself, and of cellular structure within.

Hornblende (-blend), or Amphibole, one of the most abundant and widely diffused of minerals, remarkable on account of the various forms and compositions of its crystals and crystalline particles, and of its exceedingly diversified colors, thus giving rise to almost numberless varieties, many of which have obtained distinct appellations. It is sometimes in regular distinct crystals, more generally the result of confused crystallization, appearing in masses composed of laminæ, acicular crystals, or fibers,

variously aggregated. It enters largely into the composition and forms a constituent part of several of the trap rocks, and is an important constituent of several species of metamorphic rocks, as gneiss and granite. In color hornblende exhibits various shades of green, often inclining to brown, white, and black, with every intermediate shade; it is nearly transparent in some varieties, in others opaque; hardness about the same with feldspar. Its chief constituents are silica, magnesia, and alumina.

Horned Toad, a name given to a genus of lizards of toad-like appearance, found in America west of the Mississippi. There are nine different species.

Hornellsville, Steuben co., N. Y., on Canisteo River, 91 mi. s.e. of Buffalo. Railroads: Erie; C. N. Y. & W.; N. Y. & P. Industries: sash and door mills, silk mills, iron foundries, shoe, white goods, and glove factories, railroad shops, two tanneries, furniture, carriage, wire fence, and brick and tile factories. Surrounding country agricultural. The town was first settled in 1790 and became a city in 1888. Pop. 1900, 11,918.

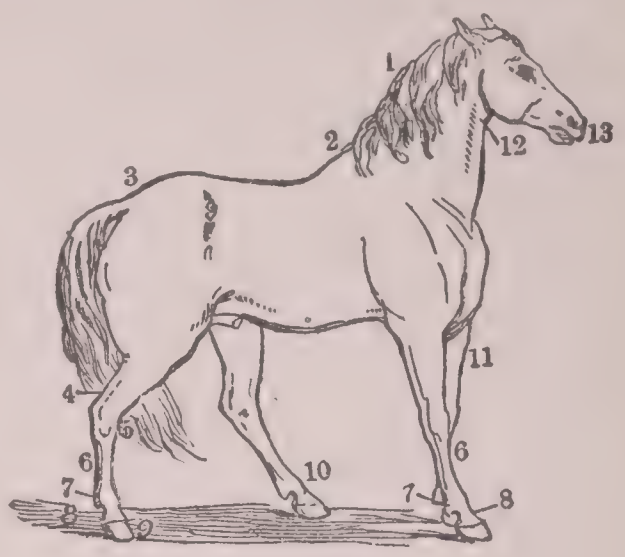
Hornet, an insect much larger and stronger than the ordinary wasp. It is very voracious, feeding on fruit, honey, etc., and preying on other insects. They form their nest of a kind of paper-work in hollow trees and walls, and are able with their sting to inflict a painful wound, usually accompanied with considerable swelling.

Hornet.

Hor'oscope in astrology, a scheme or figure of the twelve houses, or twelve signs of the zodiac, in which is marked the disposition of the heavens at a given time and place, and by which astrologers formerly told the fortunes of persons, according to the position of the stars at the time of their birth. To each of the houses was assigned a particular virtue or influence. The ascendant was that part of the heavens which was rising in the east at the moment: this was the first and most important house, or house of life, and contained the five degrees above the horizon and the twenty-five beneath it. Other houses were those of riches, marriage, death, etc.

Horse, a well-known quadruped, characterized by an undivided hoof formed by the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth in each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the male, rarely in the female. The family includes also the asses and zebras, and original types appear to have been at one time common in all parts of the world. No horses existed in America

when it was discovered by Columbus, those now found in a wild state here being descendants of those introduced by the Spaniards. But a number of fossil species have been described from America—one of them standing only two and a half feet in height. The descent of the present horse can be traced through several fossil forms back to an animal only



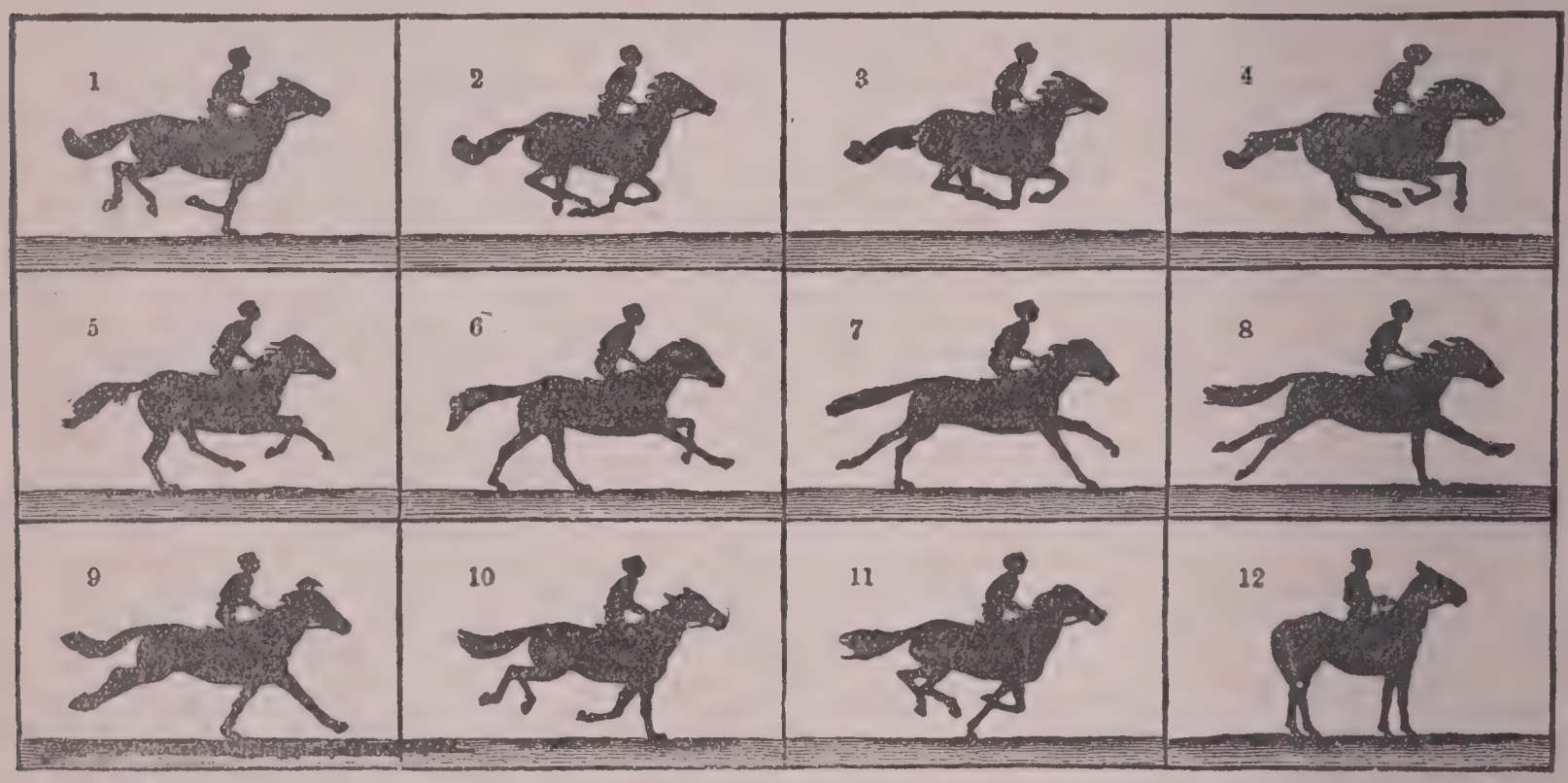
Horse, with names of parts.

1, crest; 2, withers; 3, croup; 4, hamstring; 5, hock; 6, cannon; 7, fetlock; 8, pastern; 9, hoof; 10, coronet; 11, arm; 12, gullet; 13, muzzle.

about the size of a fox, and having four separate digits or toes on the feet. Subsequent forms show how the third toe developed at the expense of the others till latterly a form identical with the common horse appeared. It is doubtful whether the horse is now anywhere to be found in its native state, the wild horses of the steppes of Tartary and other regions of the Old World being possibly descendants of animals escaped from domestication. The horse was probably first domesticated in Asia, and it varies much in form, size, and character with the climate and nature of the district it inhabits. Arabia produces perhaps the most beautiful breed, which is also swift, courageous, endurant, and persevering. As bred in America the horse has attained high perfection. Leading varieties are the Suffolk Punch, Clydesdale, and Norman, and the best for draught and agriculture; and several varieties of ponies, as Galloway, New Forest, Shetland, etc. Carriage, riding, and other horses combine the above breeds in varying degrees, as speed, strength, size, etc., are required. At the age of two years the horse is in a condition to propagate. The mare carries her young eleven months and some days, continues to breed till the age of sixteen or eighteen years, and lives on an average between twenty and thirty years. The various species of the horse family have been artificially crossed by man, and are found to be fertile with each other; the offspring, however, are generally sterile. The horse is, strictly speaking, an herbivorous animal, and is more scrupulous in the choice of his food than most other domestic quadrupeds. The staple diet on which horses are kept is oats and hay, with beans added for horses subjected to heavy work. As a substitute for, or an addition to the regular food, bran, linseed, and carrots are used. The age

of a horse can be told by the marks on its teeth, which change a little yearly until the animal is about nine years old, after which period it is difficult to determine the age by mark. In some countries the flesh of the horse is used as food; the hide is made into leather; and the hair of the mane and tail is used for making haircloth, for upholsterers' stuffing, etc. See *Hipparion.*

Horse-chestnut, a handsome genus of trees or shrubs belonging to the nat. order Sapindaceæ, having large opposite digitate leaves, and terminal panicles of showy white, yellow, or red flowers. The common horse-chestnut is familiar to every one. The seeds are large and farinaceous, and have been used as food for animals; they are bitter, and the bark also is bitter, astringent, and febrifugal. The tree



The Horse in Motion.

is said to have been brought from Constantinople to England in the beginning of the sixteenth century, and is supposed to be a native of Northern Asia. Three other species are found in North America, where they are popularly known under the name of *Buckeye.*

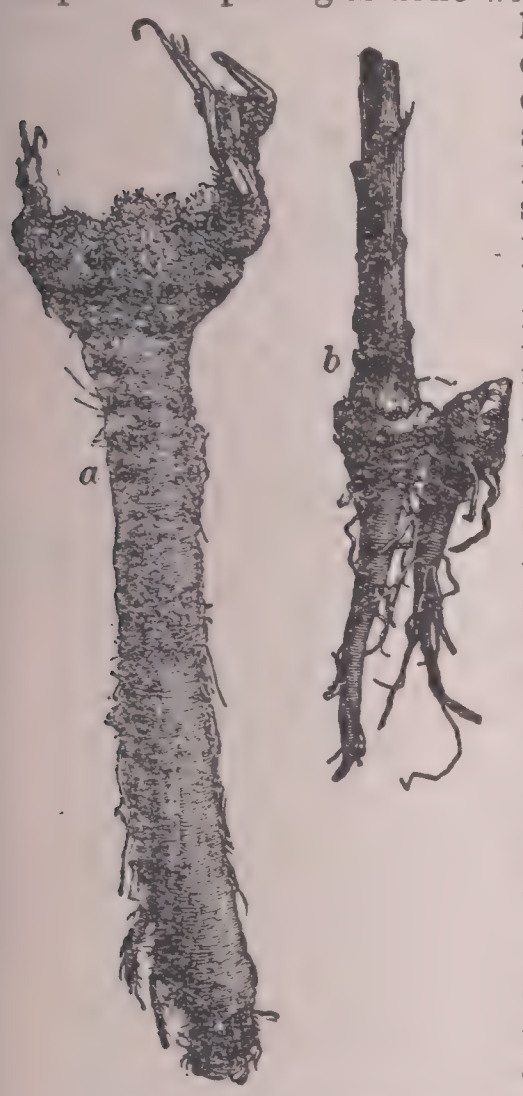
Horse Power, the power of a horse or its equivalent; the force with which a horse acts when drawing. The mode of ascertaining a horse's power is to find what weight he can raise and to what height in a given time, the horse being supposed to pull horizontally. From a variety of experiments of this sort it is found that a horse, at an average age, can raise 160 lbs. weight at the velocity of 2½ mi. per hour. The power of a horse exerted in this way is made the standard for estimating the power of a steam engine. Thus we speak of an engine of 60 or 80 horse power, each horse power being estimated as equivalent to 33,000 lbs. raised one ft. high per minute. Engineers differ widely in their estimate of the work a horse is able to execute. That given above is the estimate of Boulton and Watt based on the work of London dray horses, but it is considered much too high, 17,400 foot-pounds per minute being generally considered nearer the truth. As it matters little, however, what standard be assumed, provided it be uniformly used, that of Watt has been generally adopted. The general rule for estimating the power of a steam engine in terms of this unit is to multiply together the pressure in pounds on a square inch of the piston, the area of the piston in inches, the length of the stroke in feet, and the number of strokes per minute, the result divided by 33,000 will give the horse power, deducting one tenth for friction. As a horse can exert its full force only for about six hours a day, one horse power of machinery is equal to that of 4.4 horses. *Nominal* or *calculated horse power* is a term still used, but of little real value, from its being calculated on steam at a pressure much below the real power exerted. Sometimes the *real, actual,* or *indicated horse power* exceeds the *nominal* by as much as three to one.

Horse Radish, a cruciferous plant inhabiting the temperate parts of America, in moist situations. The root is cylindrical, whitish in color, and forms a well-known condiment, possessing a pungent taste and odor. It is also employed medicinally, as a stomachic, diaphoretic, and diuretic, and externally as a rubefacient.

Horseshoe, a shoe for horses, consisting commonly of a narrow plate of iron bent into a form somewhat resembling the letter U, so as to accommodate itself to the shape of the horse's foot. Horseshoes do not appear to have been known to the ancients. Xenophon, Vegetius, and others mention various processes for hardening the hoofs so as to make them stronger, but say nothing of any protection like the horseshoe. Iron horseshoes are mentioned as being in use in Europe in the ninth century of our era. They seem to have been introduced into England by the Normans.

When a horse is led into the shop to be shod

he is taken in hand by the floorman, who carefully removes the old shoe, if there be any. He cuts the clinches and the shoe is easily pulled off with pincers. Then he proceeds to level the foot. The fireman inspects the foot and selects a machine-made shoe of the required size and proceeds to shape and finish it. In leveling the foot the floorman first files off the dead and ragged horn with a blacksmith's rasp. The paring is done with a knife which has a slightly curved blade and curled to a hook at the end. The frog of the foot is seldom touched with the knife. When the foot is level and fully prepared, the fireman takes the work in hand and tries on the shoe he has shaped. The shoe is placed hot on the clean level surface of the hoof and any unevenness is shown by the charred horn. After the shoe has been fitted it is plunged into cold water. It is then ready to be nailed to the foot. The nail is pointed so it will curve to the outside of the hoof rather than in. When the point of the nail appears on the outside of the hoof, the curved jaw of the pincers is placed over it and the head of the nail is struck with a hammer and the point turned down and out. The point of the nail is twisted and then clinched and smoothed with a file. Horses are shod according to the work they are called upon to do.



a.—Roots of Horse Radish.
b.—Monkshood.

Horseshoeing began with the Romans about the eleventh or twelfth century. The first shoe was a thin iron plate having a rim on the outside which covered the whole ground surface of the foot. These shoes were held on by leather thongs or small cords fastened to the hoof and pastern. This was followed by a plate which had a rim held to the outside of the hoof by pointed hooks. The hooks were soon displaced by nails which had square heads. The Germans made the first horseshoes with a crease in them, during the fifteenth century, and soon after shoes were made with calks. From those clumsy shoes to the present American make of shoes was a growth of slow evolution. The greatest progress in the science and practise of horseshoeing has been made during the last quarter of a century.

Hortensius, QUINTUS (B.C. 114–50), Roman orator. He held many military and civil offices, and was elected consul for the year 69 B.C. In the previous year he had been engaged to defend Verres during the famous prosecution in which Cicero acted for the accusers. Hortensius continued to maintain a generous and friendly rivalry with Cicero, acknowledging his superior oratorical powers without jealousy.

Horticulture (or Gardening), includes, in its most extensive signification, the cultivation of esculent vegetables, fruits, and ornamental plants. In large gardens there are generally separate departments for flowers, fruits, and vegetables; but in small gardens they are usually more or less combined. A garden should be either on a level, but admitting of effectual drainage, or on a gentle slope, preferably on the lower portion of a slope facing the sun. It should be well sheltered, either naturally from situation, or artificially by means of plantations, walls, etc. The character of the soil is of much importance. A good loam, or a sandy loam mixed with humus, is the best. The former is better fitted for fruit trees, but for early crops the sandy loam is desirable. While the greater part of a garden should consist of such soil, either naturally or artificially formed, it is useful to have a portion stronger and another much lighter in order to suit the requirements of different plants. The nature of the subsoil is also important. The best is a dry bed of clay overlying sandstone. Digging, plowing, and pulverizing the soil, and exposing the surface to the action of the summer sun and the winter's frost are highly useful operations, by which the tenacity of stiff soils is overcome, weeds and insects are destroyed, and a quantity of air is admitted into the ground. Nutritive matter is frequently supplied to plants in the form of manure, either organic or inorganic. After the soil is properly dry and pulverized, the seeds are deposited, and this should always be done in dry weather, for a dry soil is especially requisite for covering in the seeds. Watering is often necessary as a means of nourishment to growing plants, especially as a support to newly transplanted vegetables, and for cleaning the leaves and destroying insects. The methods of propagating plants are various. For an account of the processes of budding and grafting see these articles. Another mode of propagation is that by means of cuttings, or shoots cut off and planted in the soil, where they take root. This process is exceedingly simple and easy in the case of many trees, as the willows and poplars; but requires some management in the heaths, myrtles, and other shrubs. In growing ornamental plants and flowers and exotic fruits, plant houses of various kinds are necessary. These comprise the numerous forms of conservatory, plant-stove, greenhouse, pits, and frames. Horticultural tools, instruments, implements, and machinery are very various.

Ho'sea, the first in order among the minor prophets of the Old Testament, but probably the third in order of time, flourishing about

750 B. C. Nothing is known of his life, except that he was the son of Beeri, and that his ministry belonged to the reigns of Uzziah, Jotham, Ahaz, and Hezekiah, kings of Judah.

Hosmer, HARRIET, sculptor, born at Watertown, Mass., 1830. She studied at Rome, and among her best-known works are ideal heads of Daphne and Medusa, Puck, the Sleeping Faun, Waking Faun, Beatrice, Cenci, etc.

Hospital, any building appropriated for the reception of any class of persons who are unable to supply their own wants, and are more or less dependent upon public help to have those wants supplied. Hence hospitals are of various kinds, according to the nature of the wants they supply, and the class of persons for whom they are intended. A large number of hospitals are medical; others are for the reception of incurables; others for the aged and infirm; others for the education of children of people in reduced circumstances; others for the reception of the wounded in battle; and so on. The first establishments of this nature are believed to belong to the fourth century after Christ. Their primary object was to afford a shelter to strangers and travelers, and it was only occasionally that the sick and infirm were admitted. One of the earliest hospitals of which we have any satisfactory information was that established by the Emperor Valens, at Cæsarea, about the end of the fourth century, and which was conducted on a very large scale. The Arabs in Spain, at an early period of their occupation of that country, founded a magnificent hospital at Cordova, where physicians were trained, who did a vast deal to advance the study of medicine. The Arabs have also the credit of having founded the first lunatic asylum in Europe, which was erected in the city of Granada. The majority of hospitals everywhere are medical. These may be divided into general and special hospitals, the former class admitting cases of all kinds; the latter class admitting only patients suffering from some special trouble. Thus there are lying-in hospitals, cancer, consumption, ophthalmic, lock (for venereal diseases), fever, and smallpox hospitals. There are also hospitals for children, and for persons suffering from incurable diseases. Such institutions serve a double purpose, inasmuch as they not only afford the best medical advice and treatment to the poor, who would otherwise be unable to obtain it, but also supply the best means of giving instruction in medicine and surgery, as in them students have the opportunity of witnessing cases of nearly every variety of disease, and observing how they are treated by the most skilled physicians and surgeons. For this reason a good infirmary, or medical hospital, is an indispensable adjunct to every school of medicine and surgery.

Hospitals for the sick and hurt are usually divided into wards, each containing a larger or smaller number of beds. Medical and surgical wards are usually kept separate, and all contagious diseases are treated by themselves in distinct buildings. Each hospital has a matron, house surgeon, and apothecary resident within its walls. The duties of the matron consist in regulating the night and day nurses, and the washing and laundry department, as well as the purchase of the necessary supplies of provisions, and keeping a general superintendence over the kitchen and messes of the sick. The house surgeon takes care of all casualties and accidents in the absence of the principal surgeons. The apothecary takes care of the pharmacy and prepares all the medicines prescribed from time to time by the surgeons and physicians. There is a well-lighted room set apart for the performance of operations, and a mortuary for the reception of corpses previous to interment. The nurses relieve each other day and night in a regular manner. Particular wards are set aside for the reception of persons laboring under various and peculiar denominations of disease. It has been objected to the present plan of constructing large edifices for hospital purposes, that the benefit they confer is greatly diminished by the risk of being attacked by hospital diseases, fever, erysipelas, pyæmia, etc., to which the patients are exposed; and the cottage or hut system of construction has been strongly advocated. This form of hospital consists of temporary, detached huts or cottages which could be easily removed or replaced. Difficulties in connection with expense and administration have made this system impracticable. The pavilion system of construction is a compromise between the large blocks and the cottages or huts. According to this system the wards should be separated from the administrative part of the establishment, and should be arranged in pavilions of one story where practicable, but never more than two. The pavilions should always surround the administrative blocks. This mode of construction is equally applicable to large and small establishments. The Royal Infirmary of Edinburgh, the Herbert Hospital of Woolwich, and the New York Hospital are among the best examples of the pavilion style. Convalescent homes, where patients are reinvigorated by a short stay after being cured in the infirmary, may be regarded as supplementary to medical hospitals, and among subsidiary institutions are dispensaries and schools for the training of nurses. The subject of the proper training of nurses has received great attention. Training schools have been organized in connection with nearly all the larger American hospitals, especially in New York and Philadelphia; and good results have followed in the largely diminished mortality of the hospitals where these trained nurses have been employed. Hospitals or asylums for inebriates have also been organized; likewise hospitals for opium habitués, and those addicted to the use of other forms of narcotics, in many parts of the U. S.

Military and Naval Hospitals, or establishments for the reception and care of sick and wounded soldiers and seamen, have been in existence in all civilized countries for a long period. Military hospitals are either permanent or temporary establishments. Temporary hospitals are any available buildings in

the immediate vicinity of the scene of operations. *Hospital ships* are ships fitted out as hospitals in all expeditions beyond the sea. They serve either as stationary hospitals, or, if the sick accumulate, can sail home, or to the nearest station. Among the few institutions yet established for the special care of the sick children may be mentioned the Sheltering Arms, Philadelphia. By intelligent treatment the mortality has rapidly decreased. Another numerous class of hospitals are those for the reception of aged men and women. Many of these are reserved for decayed members of particular professions. Among the other kinds of non-medical hospitals the only one which it is necessary to mention here are foundling hospitals and orphan hospitals.

Hotchkiss, Benjamin B. (1826–1885), inventor, b. in Watertown, Conn. He designed a field gun on a new pattern, and in 1860 submitted to the U. S. government a system of rifle projectiles, which was largely used during the Civil War. In 1867 he introduced his revolving cannon to the European governments, and since then devised a magazine rifle.

Hot Springs, Ark., a noted health resort. The springs number 60, some discharging water 150° temp. Pop. 1900, 9,973.

Hottentots, a peculiar African race, supposed to be the aboriginal occupants of the south end of that continent, at and near the Cape of Good Hope. Their limits may be said to have been the River Orange on the north and northeast and the Kei on the east. When young they are of remarkable symmetry; but their faces are ugly, and this ugliness increases with age. The complexion is a pale olive, the cheek bones project, the chin is narrow and pointed, and the face consequently is triangular. The lips are thick, the nose flat, the nostrils wide, the hair woolly, and the beard scanty. When the Dutch first settled at the Cape, in the middle of the seventeenth century, the Hottentots were a numerous nation, of pastoral and partially nomadic habits, and occupied a territory of 100,000 sq. mi. At the present day this race is nearly extinct within the wide territory which formerly belonged to it, having been entirely hunted out and dispersed by the Boers.

Hound, a name given generally to hunting dogs; but restricted by scientific writers to such as hunt by scent, a definition which excludes the greyhound. Among the varieties are the bloodhound, staghound, foxhound, harrier, and beagle. Hounds are distinguished not only by their fineness of scent, but by docility and sagacity. Of the rough-haired and smooth-haired varieties, the former manifest the greatest affection for man.

Hound's-tongue, a plant, so called from the name of its leaves.

Hou-Pe (Hu-Peh or Hoo-Pe) (North of the Lakes), a central province of China. It is intersected by the Han-kiang and the Yang-tse kiang, and is considered one of the most fertile parts of the empire. Pop. 33,365,005.

Hourglass, an instrument for measuring time, consisting usually of two hollow bulbs

placed one above the other, and having a narrow neck of communication through which a certain quantity of dry sand, water, or mercury is allowed to run from the upper to the lower bulb, the quantity of sand being adjusted so as

Hound's-tongue.

to occupy an hour in passing from one bulb to the other. The hourglass was commonly used in churches during the sixteenth and seventeenth centuries to regulate the length of the sermon.

Houseleek, a succulent plant commonly to be met with on old walls, the roofs of cottages, etc. The stem rises to the height of 8 or 10 inches, and bears a few purplish flowers, which have 12 or 15 petals. The leaves are applied to bruises and old ulcers.

Common Houseleek.

Houston, Harris co., Tex., on w. bank of Buffalo Bayou, 49 mi. n.w. of Galveston. Railroads: Southern Pacific; Gulf, Colorado and Santa Fé.; and six others. Principal industries: railroad, machine, and repair shops, cotton and oil works, carriage and wagon works, rolling mill, plow works, brass and iron foundries, cooperage shops, beef packing establishments, agricultural implement, soap, Portland cement, and fertilizer factories. Surrounding country is rich grazing and agricultural. Chief products are cotton, sugar cane, and corn. Pop. 1900, 44,633.

Houston, SAMUEL (1793–1863), American general and president of the Republic of Texas. He lost his father when quite young, and moved with his mother to Tennessee. A part of his youth was spent among the Cherokee Indians, by whom he was named "Colonel." In 1813 he enlisted in the U. S. army, and while serving under General Jackson was wounded in an engagement with the Creek Indians. He studied law in Nashville, Tenn., and served his state in Congress from 1823–1827, when he became governor of the state. His marriage in 1829 was unfortunate; he separated from his wife, and went to live among the Arkansas Indians, and was sent to Washington to represent their interests. He visited Texas in 1832, and accepted the invitation to take up his residence there, and to become leader of the colonists in the struggle for their rights. The Texans sought union with the U. S., but were denied. Santa Anna demanded that they surrender their arms, which they refused to do. Houston became commander in chief of the army organized to oppose the demand of Mexico. Santa Anna was captured in the battle of San Jacinto, April, 1836, and the independence of Texas secured. General Houston was the first president of the Republic of Texas. On the admission of Texas to the Union, Houston represented the state as senator and held the position 12 years. When the Civil War broke out he opposed secession and was compelled to leave Texas. He was of fine presence and a natural orator. He possessed a heroic and poetic nature, with a prophetic gift.

Houtzdale, Clearfield co., Pa., on Allegheny Mountains, 22 mi. from Altoona. Railroads: P. R. R.; and the A. & P. C. Industries: two flouring mills. Pop. 1900, 1,482.

Howard, JOHN (1726–1790), English philanthropist. In 1756 Howard undertook a voyage to Lisbon to view the effects of the recent earthquake. The vessel in which he embarked being captured, he was consigned to a French prison. The hardships he suffered and witnessed previous to his release first roused his attention to the subject of his future researches. In 1773 he resolved to devote his time to the investigation of the means of correcting the existing abuses in the management of prisons. With this view he visited most of the English county jails and houses of correction, and in March, 1774, he laid the result of his inquiries before the House of Commons. In 1775 and 1776 he visited many of the Continental prisons, as well as those of Scotland and Ireland. In 1789 he made a final journey through Germany and Russia, when prisons and hospitals were everywhere thrown open for his inspection as a friendly monitor and public benefactor.

Howe, ELIAS (1819–1867), inventor, b. at Spencer, Mass. He was brought up on a farm and worked as a miller. He received a common school education. At Lowell, Mass., he was employed in a cotton-machinery manufacturing establishment. While working in a machine shop in Boston, he conceived the idea which resulted in the invention of the sewing machine. He perfected the idea May, 1845, and patented his machine, Sept. 16, 1846. He was not successful in introducing it in America, and so went to Europe, but there he received little encouragement. When he returned from Europe he found manufacturers profiting by his invention. He prosecuted those who had infringed upon his rights and in 1854 his claim to priority was legally established. The principal manufacturers agreed to pay him royalties on all the machines used. After that his income was princely and his long patience had its just reward. Before the patent expired in 1867 he had accumulated a large fortune. He enlisted as a common soldier during the Civil War, and on one occasion when the pay of the regiment was delayed, he advanced the money to pay off the men. He had conferred upon him the cross of the Legion of Honor. The extensive use of the sewing machine attests its value. The shoemaking trade has been entirely revolutionized since its introduction.

Howe, JULIA WARD, author and poet, was b. in New York City in 1819. She received a careful education. At an early age Miss Ward wrote plays and poems. She was married to Dr. Samuel G. Howe, philanthropist, in 1843. She afterward continued her studies, writing philosophical essays. In 1861 she composed the popular *Battle Hymn of the Republic.* She espoused the woman suffrage movement in 1869, and has been president since 1872 of the New England Women's Club, and has presided over the Woman Suffrage Association. Mrs. Howe has published two volumes of poems, besides other writings, including, *Life of Margaret Fuller.*

Howells, WILLIAM DEAN, a novelist, b. at Martinsville, O., in 1837. He learned the printer's trade with his father; was afterward assistant editor on the *Ohio State Journal;* published a life of Abraham Lincoln and a volume of poems; was appointed in 1861 U. S. consul at Venice. On his return to America in 1865 he joined the staff of the *Nation,* became afterward editor of the *Atlantic Monthly* (1871–81), but made himself known chiefly as a writer of novels. Among his works are *Venetian Life, Italian Journeys, A Chance Acquaintance, A Foregone Conclusion, The Lady of the Aroostook, Dr. Breen's Practise, A Modern Instance, The Rise of Silas Lapham, Indian Summer.*

Howitzer, a short piece of ordnance, usually having a chamber for the powder narrower than the bore, specially designed for the horizontal firing of shells with small charges, combining in some degree the accuracy of the cannon with the caliber of the mortar, but much lighter than any gun of the same capacity. The rifled gun, throwing a shell of the same capacity from a smaller bore, and with much greater power, has superseded the howitzer for general purposes.

Howler Monkey, a genus of South American monkeys, characterized by a remarkable loudness of voice, which is due to the presence of a large chamber within the hyoid bone and the enlargement of the ventricles of the larynx. In the tropical forest of America their

hideous howls, probably a kind of amorous concert, may be heard during the night more than a mile away. They are prehensile-tailed, large, and heavy of body, with a high pyramidal head flattened on the summit.

Howrah, a town of India, on the right bank of the Hugli, opposite Calcutta, of which it is practically a suburb, and with which it communicates by a floating bridge. It has large dockyards, jute and saw mills, and various manufactories. Pop. 116,606.

Huber, FRANÇOIS (1750–1831), a Swiss naturalist. Notwithstanding the loss of his eyesight, he was able, by the help of his wife and his reader and amanuensis, to make observations and deductions which constitute decidedly the most important contribution by any one man to our knowledge of bees.

Huddersfield, a manufacturing town, in the West Riding of Yorkshire, England, 16½ mi. s. w. of Leeds. The town is the chief center of the fancy woolen trade. Broadcloths, doeskins, trouserings are also manufactured, and there are manufactories of steam engines, machinery, etc. Pop. 95,422.

Hudson, Columbia co., N. Y., on Hudson River, 114 mi. n. of New York. Railroads: N. Y. C. & H. R.; B. & A.; Kinderhook & Hudson. Industries: knitting mills and machine works, iron foundry, three cotton mills, and manufacture of agricultural implements. Surrounding country agricultural. Hudson became a city in 1787. Pop. 1900, 9,528.

Hudson, HENRY, English navigator, date of birth unknown. He sailed from London in the year 1607 in a small vessel, with only ten men and a boy, to discover the Northeast Passage, and proceeded beyond the 80th degree of latitude. In a second voyage he landed at Nova Zembla, but could get no farther eastward. In 1609 he sailed for North America, and discovered the Hudson River, which he ascended about 50 leagues. In 1610 he sailed in an English ship named the *Discovery*, and discovered Hudson Strait and Hudson's Bay, where he wintered; but his crew, after suffering many hardships, mutinied and set him adrift in a boat along with his son John and seven of the most infirm of the crew, none of whom were ever again heard of. Hudson published *Divers Voyages and Northern Discoveries* (1607), and *A Second Voyage* (1608).

Hudson Bay (or Hudson's Bay), an extensive bay, or rather an inland sea, Dominion of Canada. Hudson Bay is navigable for 4½ months in summer (from middle of June to end of October), being obstructed by drift ice during the rest of the year. There are many islands, reefs, and sandbanks. The shores on the east are high and bold; but those on the west, especially toward the south, are low and level, and much of the land here is favorable for stock and dairy farming. The white whale is found in its waters, and there is a considerable summer fishery.

Hudson River, a river rising by two branches in the northern part of the state of New York, in the Adirondack Mountains. Two small streams unite to form the river, which is afterward joined by the Schroon and Sacondaga. At Glens Falls it has a fall of 50 ft., after which it runs almost due s. to its mouth in New York Bay. Its whole course is over 300 mi.; it is navigable as far as Albany, 145 mi., for the largest vessels. The banks of the Upper Hudson are high and rocky, and scenery very picturesque.

Hudson's Bay Company, an English trading company, chartered May 2, 1670. It had long a monopoly of the trade throughout the whole territory of North America whose streams flow into Hudson's Bay, and at one time as far westward as the Pacific, with rights of governing and making war. In 1870 its authority was transferred by Act of Parliament to the crown, and its territories incorporated in the Dominion of Canada. Its trade in furs is still very large.

Hué, the capital city of Anam, on the river Hué. It was fortified in the present century in European style by French officers in the service of the king of Cochin-China. The city has a considerable trade. Pop. 50,000.

Hughes, THOMAS (1823–95), an English barrister, author, and philanthropist, b. at Uffington, Berkshire. He is widely known by his novel, *Tom Brown's School-days*, a picture of school life at Rugby, published in 1856. It was followed by *Tom Brown at Oxford, A Layman's Faith, Alfred the Great, The Manliness of Christ*, and other writings. He has devoted much of his time to the work of social elevation of the working class, encouraging in particular the co-operative system.

Hugli (or Hooghly) (hög′li), a river of Hindustan, in Bengal, formed by the junction of the Bhagirathi and the Jalangi at Nadija, about 55 mi. above Calcutta. It is 15 mi. wide at its mouth, but much encumbered by shoals. Ships drawing 17 ft. ascend as far as Calcutta. Total course about 200 mi.

Hugo (ü-gō), VICTOR MARIE (1802–1885), a French poet and novelist. His father having entered the service of Joseph Bonaparte, king of Italy, and afterward of Spain, Victor's earlier years were partly spent in those countries, but in 1812 he went with his mother to Paris. At the age of twelve he was already writing verses, and in 1823 his first novel, *Han d'Islande*, appeared, followed in 1825 by *Bug Jargal*. In 1828 a complete edition of his *Odes et Ballades* appeared. In these productions Hugo's anti-classical tendencies in style and treatment of his subject had been very visible, but the appearance of his drama *Cromwell*, with its celebrated preface, gave the watchword to the anti-classical or romantic school. *Cromwell* was too long for representation, and it was only in 1830 that *Hernani*, over which the great contest between Classicists and Romanticists took place, was brought on the stage. Other dramas followed: *Marion Delorme, Le Roi s'amuse, Lucrèce Borgia, Marie Tudor, Angelo, Ruy Blas, Les Bourgraves*. During those years he had also published a novel, *Notre Dame de Paris*, and several volumes of poetry, *Les Feuilles d'Automne, Les Chants du Crépuscle, Les Voix Intérieures, Les Rayons et*

Les Ombres. The poetry of this period has a melody and grace perhaps superior to any that he afterward wrote, but wants that deep and original sense of life which is characteristic of his later poems. During the same period he also wrote his critical essays on *Mirabeau Voltaire*, and a number of articles for the *Revue de Paris.* In 1841, after having been twice previously rejected, he was elected a member of the French Academy, made shortly afterward a tour in the Rhineland, of which he wrote a brilliant and interesting account in *Le Rhin*, published in 1842. In 1845 he was made a peer of France by Louis Philippe. The revolution of 1848 threw Hugo into the thick of the political struggle. At first his votes were decidedly Conservative, but afterward whether from suspicion of Napoleon's designs or from other reasons, he became one of the chiefs of the democratic party. After the *coup d'état*, Dec. 2, 1851, he was one of those who kept up the struggle in the streets against Napoleon to the last. He then fled to Brussels, where he published the first of his bitter satires on the founder of the Second Empire, *Napoléon le Petit.* In the following year (1853) the second, the famous volume of *Les Châtiments*, a wonderful mixture of satirical invective, lyrical passion and pathos appeared. Hugo now went to live in Jersey, was expelled along with the other French exiles in 1855 by the English government, and finally settled in Guernsey, It was in the comparative solitude and quietness of the Channel Islands that he wrote most of the great works of his later years.

Huguenots (hū′ge-nots), a term of unknown origin, applied by the Roman Catholics to the Protestants of France during the religious struggles of the sixteenth and seventeenth centuries. Under Henry II, 1547–59, the Protestant party grew strong, and under Francis II, became a political force headed by the Bourbon family, especially the King of Navarre and the Prince of Condé. At the head of the Catholic party stood the Guises, and through their influence with the weak, young king, a fanatical persecution of the Huguenots commenced. The result was that a Huguenot conspiracy, headed by Prince Louis of Condé, was formed for the purpose of compelling the king to dismiss the Guises and accept the Prince of Condé as regent of the realm. But the plot was betrayed and many of the Huguenots were executed or imprisoned. In 1560 Francis died, and during the minority of the next king, Charles IX, it was the policy of the queen mother, Catharine de Medici, to encourage the Protestants in the free exercise of their religion in order to curb the Guises. But in 1562 an attack on a Protestant meeting made by the followers of the Duke of Guise commenced a series of religious wars which desolated France almost to the end of the century. Catharine, however, began to fear that Protestantism might become a permanent power in the country, and suddenly making an alliance with the Guises between them they projected and carried out the massacre of St. Bartholomew (Aug. 26, 1572). The Protestants fled to their fortified towns and carried on a war with varying success. On the death of Charles IX, Henry III, a feeble sovereign, found himself compelled to unite with the King of Navarre, head of the house of Bourbon and heir-apparent of the French crown, against the ambitious Guises, who openly aimed at the throne, and had excited the people against him to such a degree that he was on the point of losing the crown. After the assassination of Henry III, the King of Navarre was obliged to maintain a severe struggle for the vacant throne; and not until he had, by the advice of Sully embraced the Catholic religion (1593), did he enjoy quiet possession of the kingdom as Henry IV. Five years afterward he secured to the Huguenots their civil rights by the Edict of Nantes, which confirmed to them the free exercise of their religion, and gave them equal claims with the Catholics to all offices and dignities. They were also left in possession of the fortresses which had been ceded to them for their security. This edict afforded them the means of forming a kind of republic within the kingdom, which Richelieu, who regarded it as a serious obstacle to the growth of the royal power, resolved to crush. The war waged from 1624 to 1629, when Rochelle, after an obstinate defense, fell before the royal troops; the Huguenots had to surrender all their strongholds, although they were still allowed freedom of conscience under the ministers of Richelieu and Mazarin. But when Louis XIV and Madame de Maintenon set the fashion of devoutness, a new persecution of the Protestants commenced. They were deprived of their civil rights, and bodies of dragoons were sent into the southern provinces to compel the Protestant inhabitants to abjure their faith. The Edict of Nantes was revoked in 1665, and by this act more than 500,000 Protestant subjects were driven out to carry their industry, wealth, and skill to other countries. In the reign of Louis XV a new edict was issued repressive of Protestantism, but so many voices were raised in favor of toleration that it had to be revoked. The Revolution first put the Protestants on an equality with their Catholic neighbors.

Hull, Isaac (1775–1843), American naval officer, was b. at Derby, Conn. In 1798 he became lieutenant in the new navy. By skillful seamanship he escaped the close pursuit of five British vessels, captured the British frigate *Guerriere* off Newfoundland. A gold medal was given him by Congress.

Hull, Wright co., province of Quebec, on Ottawa River. Surrounding country agricultural and mineral. Railroads: Canadian Pacific; Pontiac Pacific; Hull electric, and Ottawa electric. Industries: iron foundries, cement, lime and brick works, carriage and farm implement works, paper and pulp mills, pork packing, fiber ware, and woolen mill. The town was first settled in 1800 and became a city in 1870.

Hull (or Kingston-on-Hull), a river port of England, and a county of itself, locally situated in the East Riding of York at the influx

of the Hull into the estuary of the Humber. The industries of the town are varied, comprising flax and cotton mills, shipbuilding, rope and sail works, iron foundries, machine making, seed crushing, color making, oil boiling, etc.; but its importance arises chiefly from its shipping commerce, Hull being one of the busiest seaports in the kingdom. The docks are among the largest in the kingdom. It is an ancient town, and was of some importance long before it received its charter from Edward I. It played a conspicuous part during the civil war, being held by the Parliamentary forces, and twice besieged without success. Pop. 199,991.

Humbert I, UMBERTO, king of Italy, b. 1844, eldest son of Victor Emmanuel. In the war of 1866, in which Italy joined Prussia against Austria, he took the field in command of a division, and distinguished himself in the battle of Custozza. In 1868 he married his cousin, Margherita, daughter of Duke Ferdinand of Genoa. He succeeded his father in 1878. Assassinated July 29, 1900, by Bresci, an anarchist.

Humboldt (hụm'boĭt), FRIEDRICH HEINRICH ALEXANDER, BARON VON (1769–1859), a German traveler and naturalist, was b. at Berlin, where his father held the post of royal chamberlain. He studied at the Universities of Frankfort-on the-Oder, Berlin, and Göttingen, and also at the commercial academy in Hamburg. His first work was *Observations on the Basalt of the Rhine.* In 1791 he studied mining and botany at the mining school in Freiberg, and subsequently became overseer of the mines in Franconia. In 1797 he resolved to make a scientific journey in the tropical zones along with a friend, Aimé Bonpland. They landed in Cumana, in South America, in July, 1799, and spent five years in exploring scientifically the region of the Orinoco and the upper part of the Rio Negro, the district between Quito and Lima, the City of Mexico and the surrounding country, and the island of Cuba. In 1804 they arrived at Bordeaux, bringing with them an immense mass of fresh knowledge in geography, geology, climatology, meteorology, botany, zoology, and every branch of natural science, as well as in ethnology and political statistics. Humboldt selected Paris as his residence, no other city offering so many aids to scientific study, and remained there arranging his collections and manuscripts till March, 1805, after which he visited Rome and Naples in company with Gay-Lussac, but eventually returned to Paris in 1807, when the first volume of his great work, *Voyage aux Régions équinoxiales du Nouveau Continent*, appeared; the thirtieth and last was published in 1827. In 1827 Humboldt, who had been offered several high posts by the government of Prussia, and had accompanied the king on several journeys as part of his suite, was persuaded to give up his residence at Paris and settle at Berlin, where he combined the study of science with a certain amount of diplomatic work. In 1829, under the patronage of the Czar Nicholas, he made an expedition to Siberia and Central Asia, which resulted in some valuable discoveries, published in his *Asie Centrale.* In 1835 he published at Paris his *Examen Critique de la Géographie du Nouveau Continent.* In 1845 appeared the first volume of the *Cosmos*, his chief work, a vast and comprehensive survey of natural phenomena, in which the idea of the unity of the forces which move below the variety of nature is thoroughly grasped.

Humboldt, KARL WILHELM, BARON VON (1767–1835), brother of the preceding, was b. at Potsdam, and studied at Berlin, at Frankfort-on-the-Oder, and at Göttingen. After traveling in France and Spain, and acting as Prussian minister at Rome, he was called to fill the office of minister of the interior in connection with ecclesiastical and educational matters, and had a most important share in the educational progress which Prussia has since made. In 1810 he became minister plenipotentiary to Vienna, took an active part in the conclusion of the Peace of Paris (1814), and at the Congress of Vienna (1815), and other great diplomatic transactions. In 1819 he was an active member of the Prussian ministry, but resigned and retired to his estate at Tegel, where he d. His works include poems, literary essays, etc., but by far the most valuable are his philological writings, such as *Additions and Corrections to Adelung's Mithridates; Researches Regarding the Original Inhabitants of Spain in Connection with the Basque Language;* on the *Kawi Language of Java;* on the *Diversity of Language and its Influence on the Development of Speech;* etc.

Hume, DAVID (1711–1776), an eminent historian and philosopher, was b. at Edinburgh, Scotland. He was destined for the law, but was drawn away by his love of literature and philosophy; and retired to France, where during three years of quiet and studious life he composed his *Treatise upon Human Nature.* The work was published at London in 1738, but, in his own words, "fell dead-born from the press." His next work, *Essays, Moral, Political, and Literary*, met with a better reception. In 1745 he became companion to the insane Marquis of Annandale; and he accompanied General Sinclair in 1746 and 1747 in his expedition against France and in a military embassy to Vienna and Turin. He now published a recasting of his *Treatise upon Human Nature*, under the title of an *Inquiry Concerning the Human Understanding.* In 1752 he published his *Political Discourses*, which were well received, and his *Inquiry Concerning the Principles of Morals.* The same year he obtained the appointment of librarian of the Advocates' Library at Edinburgh, and began to write his history of England, of which the first volume appeared in 1754. In 1763 he accepted an invitation from the Earl of Hertford, then proceeding as ambassador to Paris, to accompany him, and was enthusiastically received by Parisian circles in his character of philosopher and historian. After the departure of Lord Hertford in 1756, he remained as *chargé d'affaires*, and returned to England in 1766, bringing with him Rousseau, for whom he procured a pension and a retreat in Derby-

shire. But the morbid sensitivity of Rousseau brought about a disagreement which put an end to the friendship. In 1767 he was appointed under secretary of state, a post which he held till 1767, when he retired to Edinburgh. As a philosopher, in which quality his reputation is perhaps greatest, Hume's acute skeptical intellect did great service by directing research to the precise character of the fundamental conceptions on which our knowledge and our beliefs are based. His acute negative criticism of these conceptions compelled philosophy either to come to a dead halt or to find a new view of the nature of human reason.

Humming Birds, the name given to a family of minute and beautiful birds, so called

Humming Bird and Humming-bird Hawk Moth.

from the sound of their wings in flight. The beak is slender, generally long, sometimes straight and sometimes curved; the tongue is long, filiform, bifid at the point, and capable of being protruded to a considerable distance. In size humming birds vary from that of a wren to that of a humble bee. They never light to take food, but feed while on the wing, hovering before a flower, supported by a rapid vibratory movement of the wings which produces the humming noise. Insects form a great proportion of their food. These beautiful birds are peculiar to America, and almost exclusively tropical. One species, the ruby-throated humming bird, is common in the northeast of the U. S. The only note of the humming bird is a single chirp, not louder than that of a cricket. It is very fearless and irascible, two males scarcely ever meeting without a contest. Among the more remarkable of these birds is the tufted-necked humming bird of Guiana and Northern Brazil. In this species the crest, outer tail feathers, and neck plumes are reddish chestnut, the latter tipped with green, the throat and upper part of the breast are emerald green, the back bronze green. Perhaps four hundred species of humming birds are now known.

a.—Sword-bill Humming Bird (*Docimastes ensifer*); *b.*—White-booted Racket-tail (*Stegaurus Underwoodi*); *c. c'.*—Male and female Tufted Conquette (*Lophornis ornata*).

Humphreys, Andrew A. (1810–1883), b. in Philadelphia and graduated at West Point in 1831. He joined Mc Clellan's staff in 1861, and was made brigadier general of volunteers in 1862. In September of the same year he commanded a division of the fifth corps of the army of the Potomac. He was promoted major general of volunteers in 1863. After the surrender he received a major general's brevet, U. S. army, and had charge of the district of Pennsylvania.

Hungary, a kingdom in the s.e. of Europe, forming, together with Austria, the Austro-Hungarian monarchy. It includes Hungary proper with Transylvania, Slavonia, Croatia, the Croato-Slavonian Military Frontiers, etc., total area 125,039 sq. mi., with a pop. of 16,355,686. Hungary proper (including Transylvania), area 108,258 sq. mi. and a pop. (1891) of 15,122,514, may be considered as a large basin surrounded by mountains on every side except the south. Of these the principal are the Carpathians, which cover the northern and eastern parts of the country with their ramifications. The Danube and the Theiss, with their affluents, are the chief rivers. The Poprad, in the north, is tributary to the Vistula, being the only Hungarian river not belonging to the basin of the Danube. The Drave forms the southwest frontier on the side of Croatia and Slavonia. Between the Danube and the Drave lie the two principal lakes, the Platten See or Balaton Lake and the Neusiedler See from which the water occasionally disappears. Hungary is one of the healthiest countries in Europe, and generally has a fertile soil. All kinds of grain, especially excellent wheat, wines, fruits, tobacco, hemp, flax, hops, saffron, woad, madder, sumach, cotton are among the products of Hungary. Horses, cattle, sheep, hogs, game (in the north bears), poultry, fish (especially the sturgeon and salmon), bees, and silkworms are among the productions of the animal kingdom. Among the minerals are gold, silver, copper, iron, lead, zinc, cobalt, antimony, sulphur, arsenic, salt, etc., with coals and peat. The situation of Hungary, which occupies an area where the various

races of Europe meet and interlace, accounts for the variety of nationalities it contains. These comprise, beside the Hungarians or Magyars, (over 6,000,000 in number), Roumanians, Slovacks, Germans, Servians, Ruthenians, etc. The Magyars, who are the dominant race, are located for the most part compactly in the center of the kingdom. They are brave, high-spirited, and sincere, in many respects resembling their kinsmen the Turks. A decided majority are Roman Catholics, the rest Protestants, chiefly Calvinists, with a few Greek Catholics. The Germans have settled all over the country, and there is scarcely a town of Hungary which is not at least partly inhabited by Germans, while some are essentially German. Science, literature, the press, trade, and industry, are for the greater part in their hands. The Hungarian has a natural inclination to agriculture and the breeding of cattle, and the fertility of the soil making up for some deficiencies in methods has made Hungary one of the chief corn-growing countries of Europe. It is also celebrated for its wines, the finest variety of which is the Tokay. There are few extensive manufactures in Hungary. Iron and steel works, potteries, glass manufactories, sugar refineries, soap and tallow works, are among the principal. The production of coal and iron is increasing. With regard to popular education Hungary is behind the Austrian part of the empire, but education was made compulsory in 1868. There are universities at Budapest, Klausenburg, and Agram. The Hungarian language is nearly allied to the Turkish and Finnish, but not to any other tongue spoken in Europe. It has latterly been carefully cultivated, and Hungarians have distinguished themselves in all branches of literature. Among modern names we can only mention those of Andrew Horváth, Eötvös, A. and C. Kisfaludy, Garay, Vörösmarty, Petöfi, Kerény, Arany, Josika, and Jokay. Besides its representation in the controlling body of Delegations (see *Austria*) Hungary since 1867 has an independent Diet, consisting of an Upper and Lower House, the first composed of hereditary and life peers, church dignitaries and state dignitaries; the second of representatives elected by vote. The Austrian emperor is only king of Hungary. Croatia and Slavonia have a common diet of their own for the management of internal affairs.

History.—The Magyars, an Asiatic people of Turanian race, allied to the Finns and the Turks, dwelt in what is now Southern Russia before they descended under Arpád into the plain of the Danube, toward the end of the ninth century, and conquered the whole of Hungary and Transylvania. During the first half of the tenth century their invasions and incursions spread terror throughout Germany, France, and Italy; but at length their total defeat by Otho I of Germany put an end to their maraudings, and under their native dynasty of Arpáds they settled down to learn agriculture and the arts of peace. Stephen I (997–1030) was the first who was successful in extending

Hungary

Christianity generally among the Hungarians, and was rewarded by a crown from Pope Sylvester II and with the title of *apostolic king* (1000). Stephen encouraged learning and literature, and under him Latin became not only the official language of the government, but the vehicle of Hungarian civilization, which it unfortunately continued to be for the next 800 years. In 1089 King Ladislaus extended the boundaries of Hungary by the conquest of Croatia and Slavonia, and King Coloman by that of Dalmatia in 1102. During the twelfth century the Hungarians first attained, through French connections, a certain refinement of life and manners. About the middle of the thirteenth century King Bela induced many Germans to settle in the country which had been depopulated by the Mongol invasions. With Andrew III (1290–1301) the male line of the Arpád dynasty became extinct, and the royal dignity now became purely elective. Charles Robert of Anjou was the first elected (1309). Louis I (1342–82) added Poland, Red Russia, Moldavia, and a part of Servia, to his kingdom. The reign of Sigismund (1387–1437), who was elected emperor of Germany, interesting from the invasion of Hungary by the Turks (1391), and the war with the Hussites. Sigismund introduced various reforms, and founded an academy at Buda. Matthias Corvinus (1458–90), combining the talents of a diplomatist and general, was equally successful against his enemies at home and abroad, and is even yet remembered by the popular mind as the ideal of a just and firm ruler. He founded a university at Pressburg.

During the reigns of Ladislaus II (1490–1516) and Louis II (1516–26) the rapacity of the magnates and domestic troubles brought the power of Hungary low, and the battle of Mohacs (1526) made a great part of the country a Turkish province for 160 years. The rest was left in dispute between Ferdinand of Austria and John Zapolya, but eventually by the help of the Protestants passed to the former, and has since remained under the scepter of the Hapsburgs. In 1686 Leopold I took Buda and recovered most of Hungary and Transylvania. In 1724 Charles VI secured by the Pragmatic Sanction the Hungarian crown to the female descendants of the house of Hapsburg, and the loyalty of the Hungarians to his daughter, Maria Theresa, saved the dynasty from ruin. Maria Theresa did much for the improvement of Hungary by the promulgation of the rural code called Urbarium, and by the formation of village schools. On the advent of the French Revolution, and during the wars which ensued, the Hungarians once more played a prominent part in support of the Hapsburg crown. Napoleon fell, but the revolution had given an impetus to ideas of national and popular rights which the Hungarians, long stifled under the Germanic traditions and tendencies of their rulers, were among the first to feel. For a time Francis I and Metternich stood stiffly out against all concessions, and tried to govern by pure absolutism, but ended by summoning in 1825 a new diet. The diet distinguished itself

by adopting the Magyar language in its debates instead of the Latin to which it had been accustomed. Succeeding diets in 1830 and 1832 made new demands in the direction of religious equality, a popular suffrage, and abrogation of the privileges of the nobles. The Austrian government attempted to repress the Hungarian national movement by imprisoning Deák, Kossuth, and others of the leaders. The struggle continued till 1848, when the French revolution of that year gave the impulse for a similar rising in Vienna. Prince Metternich fled to London, and the Viennese court made a formal concession of all important demands; but these had no sooner been granted than the government began secretly to work against their being put in operation. The dependencies of the Hungarian crown, the Croats and the Wallachians of Transylvania were privately encouraged to revolt, and in December of the same year an Austrian army took the field with the avowed object of annihilating the independence of Hungary; but a series of pitched battles resulted on the whole so much in favor of the Hungarians that Austria was obliged to call in the aid of Russia, which was at once granted. After a heroic struggle the Hungarians had to succumb. The nation was reduced to the position of a province; and some of the greatest statesmen and soldiers of Hungary perished on the scaffold. But the struggle was continued by the Hungarians in the form of a constitutional agitation, and at last, when the battle of Sadowa in 1866 separated Austria from Germany, Austria, left face to face with a nation almost as powerful and numerous as itself, felt compelled to submit. In 1867 a separate constitution and administration for Hungary was decreed, and on June 8 the emperor and empress were crowned king and queen of Hungary with the utmost pomp, according to the ancient ceremonies of a Hungarian coronation. The dualism of the Austrian Empire was thus finally constituted.

Hungerford, Mrs. Margaret, an Irish authoress, born and educated in Ireland. She was better known as "The Duchess." Her best known works are *Phyllis*, *Beauties' Daughters*, *A Maiden All Forlorn*, and *A Mental Struggle*. She d. in 1897.

Huns, a nomadic and warlike people of Asia, of Mongolian race, part of whom entered Europe, probably in the fourth century after Christ, conquered the Alans, and drove the Goths out of Dacia. They continued to extend their dominion along the Danube till the time of Attila (434 A. D.), who uniting the whole Hunnish power in one hand became the most powerful prince of his time. His defeat near Chalons was the commencement of the decline of the power of the Huns, and within a generation after his death in 453, the great Hunnish Empire had completely disappeared, and the race been absorbed among other barbarous peoples. The term Huns was used by ancient and mediæval writers in a very vague way to indicate barbarous hordes invading Europe from the northeast. The Huns are described as a race of dark complexion with small, black eyes, flat noses, and broad shoulders.

Hunt, James Henry Leigh (1784-1859), an English poet and essayist, He was educated at Christchurch hospital, entered the office of his brother, an attorney, and afterward obtained a situation in the war office. In 1808, in conjunction with his brother John, he started the *Examiner* newspaper, which soon became prominent for the fearlessness with which public matters were discussed. In 1818 appeared *Foliage*, a collection of original poems and translations from Homer, Theocritus, Bion, etc., and in 1819 the *Indicator* was started, a weekly journal on the model of the *Spectator*, which contained some of his best essays. In 1822 he proceeded to Italy, having received an invitation thither from Byron and Shelley, and, in conjunction with the former, carried on a newspaper called the *Liberal*, but it proved unsuccessful. Among his works may be mentioned, *Stories from the Italian Poets* (two vols. 1846); *Men, Women, and Books* (1847); *Autobiography* (three vols, 1850); *Table Talk* (1850).

Hunt, William Holman, an English painter, b. in 1827 at London. He was trained in the Royal Academy school, and began to exhibit in 1846. He belongs to the so-called Pre-Raphaelite school of English artists. In 1853 his *Claudio and Isabella* first attracted public attention, followed next year by the *Light of the World* (Christ teaching in the temple). Mr. Hunt then made a journey to the East, the fruits of which are observable in the local coloring and strength of realization in his succeeding pictures of Eastern life, among which we may mention *The Scapegoat; The Finding of the Saviour in the Temple; Shadow of the Cross; Plains of Esdraelon; Triumph of the Innocents.*

Huntingdon, Huntingdon co., Pa., on Juniata River, 34 mi. e. of Altoona. Railroads: Pennsylvania, and Huntingdon & Broadtop terminus. Industries: sewer pipe works, two flouring mills, four iron foundries, mfg. stationers, furniture factory, and two planing mills. Surrounding country principally agricultural. The town was first settled in 1767; incorporated as borough 1796. Pop. 1900, 6,053.

Huntington, Huntington co., Ind., on Little Wabash River, 24 mi. w. of Fort Wayne. Railroads: C. & E., and Wabash. Natural gas in large quantities. Industries: railroad shops, flouring mills, iron foundry, shoe, bicycle, and stove factories, and three planing mills. The town was first settled in 1831 and became a city in 1873. Pop. 1900, 9,491.

Huntington, Cabell co., W. Va., on Ohio River, 160 mi. s.e. of Cincinnati. Surrounding country agricultural and mineral. Railroads: Chesapeake & Ohio; Norfolk & Western; Ohio River; Newport News & Mississippi Valley; and the Huntington & Big Sandy. Industries: car manufacturing, flouring, woolen, saw, and planing mills, iron foundries, box, broom, frame, hub, and other factories. The town was first settled in 1871 and became a city in 1873. Pop. 1900, 11,923.

Huntington, Suffolk co., N. Y., on Huntington Bay, 38 mi. e. of New York. Surrounding country agricultural. Railroad, Long Island. Industries: thimble factory, pottery, saw mills, etc. Pop. 1900, 9,483.

Huntington, DANIEL, artist and president of the National Academy, was born in New York in 1816. He studied at Hamilton College. In 1836 he spent some months in the Highlands of the Hudson, and painted several views. After a visit to Europe in 1839 he returned to New York and devoted himself to portraits, but has executed a great number of genre and historical pieces. In 1862–69 was president of the National Academy, and again in 1877. Among his later works are *Philosophy and Christian Art*, (1878), and *Goldsmith's Daughter* (1884). Among his portraits are those of President Lincoln and U. S. Senator John Sherman.

Huntsville, Madison co., Ala., 24 mi. e. of Decatur. Railroads: Memphis & Charleston; N. C. & St. L. Industries: carriage and machine shops, cotton seed oil mill, cotton compress, foundries, railroad car works, wagon factories, cotton factory, and tobacco warehouse. It is located in a fertile farming and stock raising district, chief products being live stock, corn, wheat, and fruit. Pop. 1900, 8,068.

Hurdy-gurdy, a stringed instrument played by turning a handle. Its tones are produced by the friction of the wheel acting a part of a bow against four strings, two of which are pressed by the fingers or by keys. The other two strings are tuned a fifth apart to produce a drone bass, and are not stopped by the fingers or keys.

Huron, LAKE, one of the five great lakes. Area 21,000 mi. It lies 578 ft. above sea level. The lake contains several thousand islands, varying in size from a few square feet to huge islands like the great Manitoulin, which is about 107 mi. long and from 4 to 25 mi wide, and is the only one inhabited. The waters are very clear and pure, abound in fish, and have a depth averaging from 800 to 1,000 ft.

Hurons. See *Wyandottes.*

Husband and Wife.—The position of the wife in the earliest Roman household was regarded by the law of *Manus.* She fell under the "hand" of her husband, became one of his family, along with his sons and daughters, natural or adopted, and his slaves. The dominion which, so far as the children were concerned, was known as the *patria potestas*, was, with reference to the wife, called the *manus.* The subject members of the family, whether wife or children, had, broadly speaking, no rights of their own, and were merged in the *potestas* of the husband and father. On the death of the husband the wife succeeded, like the children, to freedom and a share of the inheritance. The later Roman marriage left the spouses comparatively independent of each other. The bond was easily dissolved, and while it lasted was loose and easy. The law preferred to leave the parties to arrange their mutual rights and obligations by private contracts. Hence the importance of the *Law of Settlements.* During the marriage the husband had the administration of the property, and its destination afterward might depend on the nature of the settlement and the conduct of the parties. On the continent of Europe, after many centuries, a theory of marriage became established, the leading feature of which is the community of goods between husband and wife. This community or nuptial partnership generally extends to all the movable property of the husband and wife, and to the fruits, income, and revenue thereof. It extends also to all immovable property of the husband and wife acquired during the marriage, but not to such immovable property as either possessed at the time of the marriage, or which came to them afterward by title of succession or by gift. The property thus acquired by this nuptial partnership is liable to the debts of the parties existing at the time of the marriage; to the debts contracted by the husband during the community, or by the wife during the community with the consent of the husband; and to debts contracted for the maintenance of the family. The husband alone is entitled to administer the property of the community, and he may aliene, sell, or mortgage it without the concurrence of the wife. But he cannot dispose by will of more than his share of the common property, nor can he part with it gratuitously *inter vivos.* On separation of body or of property the wife is entitled to the full control of her movable property, but cannot aliene her immovable property without her husband's consent or legal authority. On the death of either party the property is divided in equal moieties between the survivor and the heirs of the deceased. In English common law, husband and wife are said to be one person in the eye of the law. Hence a man cannot grant or give anything to his wife, because she is himself, and if there are any compacts between them before marriage they are dissolved by the union of persons. Hence, too, the old rule of law, now greatly modified, that husband and wife could not be allowed to give evidence against each other in any trial, civil or criminal. The unity, however, is one sided only; it is the wife who is merged in the husband, not the husband in the wife. And when the theory does not apply the disabilities of a *coverture* suspend the active exercise of the wife's legal faculties. From one point of view the wife is merged in the husband, from another she is one of his vassals. A curious example is the immunity of the wife in certain cases from punishments for crime committed in the presence and on the presumed coercion of the husband. In the U. S. the relation of husband and wife is a subject of state law, and the positions taken in the various states are so numerous and varied as to preclude mention in detail in this article. It may, however, be stated that the different states have founded their statutes on the subject of the English law, which is more or less modified to meet various exigencies arising in the experience of the people.

Huss, (or Hus) JOHN (1373–1415), Bohemian religious reformer. He studied at the University of Prague, took the degree of Master of Arts in 1396, and in 1398 began to lecture on theology and philosophy. Since 1391 he had been acquainted with the writings of Wickliffe, and his denunciation of the papal indulgences, of masses for the dead, of auricular confession, etc., alarmed Archbishop Sbynko of Prague, who had the preaching prohibited. Huss appealed to the pope, John XXIII, who summoned him to appear at Rome. Huss refused to appear, and was in consequence excommunicated, and Prague laid under an interdict as long as Huss should remain in it. The people of Prague, however, stood by their preacher, and the pope was compelled to acquiesce. But the quarrel broke out again when Huss and his friend Jerome publicly condemned the papal indulgences granted for the crusade against Ladislaus of Naples. Huss was again excommunicated and Prague interdicted. The reformer retired to Hussinatz to the protection of his feudal lord, and here he wrote his books *On the Six Errors* and *On the Church*, in which he attacks transubstantiation, the belief in the pope and the saints, the efficacy of the absolution of a vicious priest, unconditional obedience to earthly rulers, and simony, which was then extremely prevalent, and makes the Scriptures the only rule of matters of religion. The approbation with which these doctrines were received, both among the nobility and common people, increased the party of Huss in a great degree, and emboldened him to comply with the summons of the Council of Constance to defend his opinions before it. The Emperor Sigismund, by letters of safe conduct, became responsible for his personal safety; and John XXIII, after his arrival at Constance, November 4, made promises to the same effect. Notwithstanding this, he was thrown into prison, November 28, and after several public examinations, conducted with little regard to justice and the rights of the accused, he was sentenced to death and burned alive, and his ashes thrown into the Rhine.

Hussites, the followers of John Huss. After the death of Huss, his adherents took up arms for the defense of their principles, and under the leadership of Johann Ziska, captured Prague, fortified Mount Tabor, and repeatedly defeated the troops sent against them by the Emperor Sigismund, who had succeeded to the crown of Bohemia. Ziska died in 1424, and was succeeded by Procopius, who also distinguished himself by many victories. The excesses of this party, however, who were called the *Taborites*, alienated the moderate Hussites, who called themselves *Calixtines*, and who finally united with the Catholics by the Compact of Prague in 1433 to acknowledge Sigismund as king, certain concessions, especially the use of the cup for the laity, having been made to them by the Council of Basel. The Taborites thus weakened were totally defeated at Bömischbrod on May 31, 1434, and afterward declined as a political party, finally becoming merged in the Bohemian Brethren.

Hutchinson, ANNE (1590–1643), b. in Lincolnshire, England, where she married a Mr. Hutchinson and in 1634 went to Boston, Mass. She had peculiar theological views, held meetings, lectured, and denounced the Massachusetts clergy. She was tried for heresy and banished from the colony. With some of her friends she went to Rhode Island and started a community there. At the death of her husband she went to a new settlement in New York where she and her daughters were massacred by the Indians.

Hutchinson, Reno co., Kan., on Arkansas River, 229 mi. s.w. of Kansas City. Railroads: A. T. & S. F.; C. R. I. & P.; M. P.; and Hutchinson & Southern. Industries: fifteen salt plants, three flouring mills, two iron foundries, cigar, match factories, and a large creamery. Surrounding country agricultural. First town in Kansas to advertise as a temperance town. In 1887 salt was discovered and it is to-day the largest producer of dairy and table salt in the world. The town was first settled in 1871 and became a city in 1872. Pop. 1900, 9,379.

Hutton, JAMES (1726–1797), Scottish geologist, b. at Edinburgh. His name is especially connected with a geological system, the chief features of which are his recognition of the similarity of processes in the past and present, and his theory of igneous fusion as accounting for most geological phenomena. Among his numerous works are an *Investigation of the Principles of Knowledge, Theory of Rain, Theory of the Earth, with Proofs and Illustrations.*

Huxley, THOMAS HENRY (1825–1895), a famous English naturalist. He graduated M. B. at the University of London in 1845, and entered the royal navy as assistant surgeon in 1846. He sailed with H. M. S. *Rattlesnake* on a surveying expedition to Australasia, during which he sent a number of valuable papers to the Royal Society. He has been professor of natural history in the school of mines, Fullerian professor of physiology to the Royal Institution, Hunterian professor in the Royal College of Surgeons, president of the British Association meeting held at Liverpool in 1870, lord rector of Aberdeen University in 1872, secretary of the Royal Society, substitute professor of natural history for Professor Wyville Thompson at Edinburgh in 1875 and 1876, a member of various royal commissions on fisheries, vivisection, universities, etc.; and inspector of salmon fisheries, but resigned this and almost all his other offices in 1885 on account of ill health. Amongst his works are *The Oceanic Hydrozoa, On the Theory of the Vertebrate Skull, Man's Place in Nature, On Our Knowledge of the Causes of the Phenomena of Organic Nature,* a series of lectures to working men delivered in 1862, *Elements of Comparative Anatomy, Elementary Physiology, Introduction to the Classification of Animals, Lay Sermons, Addresses and Reviews, Critiques and Addresses, American Addresses, Physiography, Anatomy of Invertebrate Animals, The Crawfish, Science and Culture* (1882). Professor Huxley received numerous academic distinctions.

Hyacinth.

Hy′acinth, a genus of liliaceous bulbous plants, including about thirty species, among which the garden hyacinth is celebrated for the immense varieties which culture has produced from it. It is a native of the Levant, and was first cultivated as a garden flower by the Dutch about the beginning of the sixteenth century.

Hybrid, the produce of a female animal or plant which has been impregnated by a male of a different but nearly allied species or genus. Much uncertainty prevails respecting the productive crossing of species, but it seems to be established that while the crossing of different genera may result in offspring, that of different orders will not. Hybrids are obtained among fishes from different species of carp; among birds, from the goldfinch and canary, the swan and the goose, etc.; among mammals, from the horse and the zebra, the horse and the ass, the produce of the last two being the mule proper; from the lion and tiger, the dog and wolf, the dog and fox, the goat and ibex. Instances of hybrids between animals of different genera have been furnished by the union of the goat and the antelope, and of the stag and the cow. It used formerly to be considered that the propagative power of hybrids was absolutely null, or that they propagated only with an individual of the pure breed; but the experiments of Darwin and other recent researches have shown that although infertility to some degree generally attends sexual intercourse between different species, yet in such intercourse every degree of difference from absolute sterility up to complete fertility is found. The results hitherto obtained may be summarized as follows: The crossing of species of different families is in almost every case infertile; allied species are capable of producing offspring, and this capability is in indefinite ratio to the degree of their likeness; hybrids are frequently fertile with their parents, but more rarely among themselves; there is no fixed relation between the degree of fertility manifested by the parent species when crossed and that which is manifested by their hybrid progeny. In many cases two pure species can be crossed with unusual facility, while the resulting hybrids are sterile; on the other hand, there are species which can only be crossed with extreme difficulty, though the hybrids produced are fertile.

Hyde Park, Norfolk co., Mass., on Neponset River, 8 mi. s. by w. of Boston. Railroads: Old Col., and N. Y. & N. E. Industries: cotton and woolen goods, paper, curled hair, machinery. Pop. 1900, 13,244.

Hyderabad (or Haidarabad) (hi-d*a*r-ä-bȧd′), a state of Hindustan; area 80,000 sq. mi. The chief products are rice, wheat, maize, sugar cane, tobacco, cotton, indigo, fruits, and timber. Pop. 9,845,594. The ruler of Hyderabad belongs to a dynasty founded by Asaf Jah, a distinguished soldier, whom the emperor Aurungzeb made viceroy of the Deccan in 1718, with the title of Nizam, or Regulator. Mir Mahbub Ali, the present Nizam, was b. in 1866, and is in point of rank the first Mohammedan ruler in India, with a regular army of about 15,000, beside numerous irregulars. HYDERABAD, the capital, is situated on the River Musi, at an elevation of 1,672 ft. above the sea. Among the chief buildings are the extensive palace of the Nizam, the British residency, the Char Minar, or Four Minarets, built about 1590 as a Mohammedan college, but now used for warehouses; the *Jama Musjid*, or cathedral mosque, designed after the one at Mecca. There are manufactures of silks, trinkets, and turbans. Pop. of city, 415,039.

Hyder Ali (1728–1782), a distinguished Indian prince, son of a general in the service of the Rajah of Mysore. By his military talents he became the actual ruler of Mysore, and in 1762 deposed Kandih Rao, and had himself chosen Rajah. He encouraged agriculture and commerce, reorganized the army, and so greatly extended his dominions that in 1766 they contained 84,000 sq. mi., and afforded an immense revenue.

Hydra, in Greek mythology, a celebrated monster, which infested the neighborhood of Lake Lerna in the Peloponnesus. Some accounts give it an hundred heads, others fifty, others nine. As soon as one of these heads was cut off two immediately grew up if the wound was not stopped by fire. It was one of the labors of Hercules to destroy this monster, and this he effected with the assistance of Iolaus, who applied a burning iron to the wounds as soon as one head was cut off.

Hydra, (the name is also found as Sidra, Nidra, Idero, etc., and the ancient form was Hydrea), an island of Greece, lying about four miles off the southeast coast of Argolis in the Peloponnesus, and forming along with the neighboring island of Dhoko the bay of Hydra. The length of the main axis of the island, which runs from southwest to northeast is about 11 miles, and the area is about 21 square miles. It is little better than a rocky and treeless ridge with only a patch or two of arable soil. The highest point, Mount Ere, has an elevation of 1,958 feet. The next in importance is known as the Prophet Elias, from the large convent of that name on its summit. The fact that in former times the island was richly clad with woods is indicated by the name still employed by the Turks, *Tchamliza*, the place of pines; but it is only in some favored spots that a few trees are now found. Tradition has it that the island was once well-watered, hence the designation Hydrea, but the inhabitants are now wholly dependent upon the rain supply, and they have sometimes had to bring water from the mainland. Earthquakes are

not infrequent; that of 1769 continued for six whole days. Hydra, the chief town, is built near the middle of the northern coast, on a very irregular site, consisting of three hills and the intervening valleys. From the sea its white and handsome houses present a picturesque and noble appearance, and its streets though narrow are clean and attractive. Besides the principal harbor around which the town is built there are three other ports on the north coast, but none of them is sufficiently sheltered. Almost all the population of the island is collected in the chief towns, which is the seat of a bishop, and has a local court, numerous churches, and a high school. Cotton and silk weaving, tanning and ship-building are carried on, and there is a fairly active trade. Hydra was of no importance in ancient times. The only fact in its history is that the people of Hermione (a city on the neighboring mainland now known as Kastri) surrendered it to the Samian refugees, and that from these the people of Tœzen received it in trust. In 1580 it was chosen as a refuge by a body of Albanians from Kokkinyas in Trœzenia; and other emigrants followed for the next sixty years. At the close of the seventeenth century the Hydroites took part in the reviving commerce of the Peloponnesus; and in course of time they cxtended thelr range. About 1716 they began to build boats and to visit the islands of the Ægean. Not long after they built still larger ships and sailed as far as Alexandria, Constantinople, Triste and Venice; and by and by they ventured to France and even to America. From the grain trade of South Russia especially they derived great wealth. In 1813 there were about 22,000 people in the island, and of these 10,000 were seafarers. At the time of the outbreak of the war of Greek independence the total population was 28,190, of whom 16,460 were natives and the rest foreigners. One of their chief families was worth $10,000,000. Into the struggle the Hyderiotes flung themselves with rare enthusiasm and devotion, and the final deliverance of Greece was mainly due to the service rendered by their fleets. The present population of the island is 7,342; of the town, 6,446.

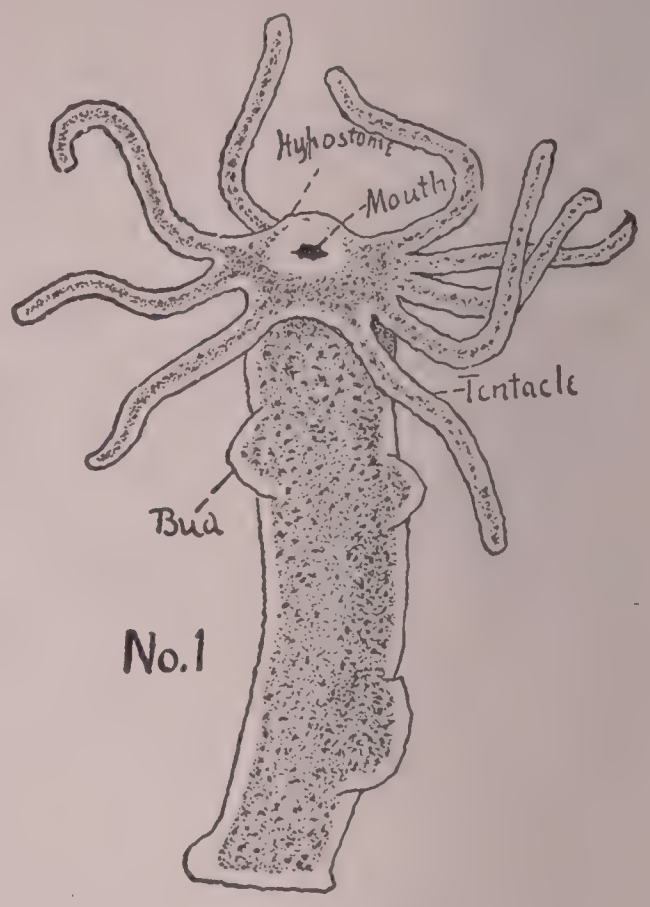
Hydra, Fresh-Water, a small animal found in pond-water, also known as fresh-water polyp.

The hydra can be seen easily with the naked eye. The thickness is about that of fine sewing cotton, and the length one-twelfth to one-fourth of an inch. The color varies, some being white, others tawny or green. They adhere to twigs or weeds in the water. They cling on by one end, and on the free end may be seen, by means of an ordinary pocket lens, a number of very delicate threads or filaments, which are called *tentacles.*

If examined under a low-power microscope, a hydra is seen to have a cylindrical body, attached by a flattened base to whatever object with which it is in contact. At the opposite or free end there is a conical structure, at the apex of which is a circular opening, the mouth, shown in No. 1.

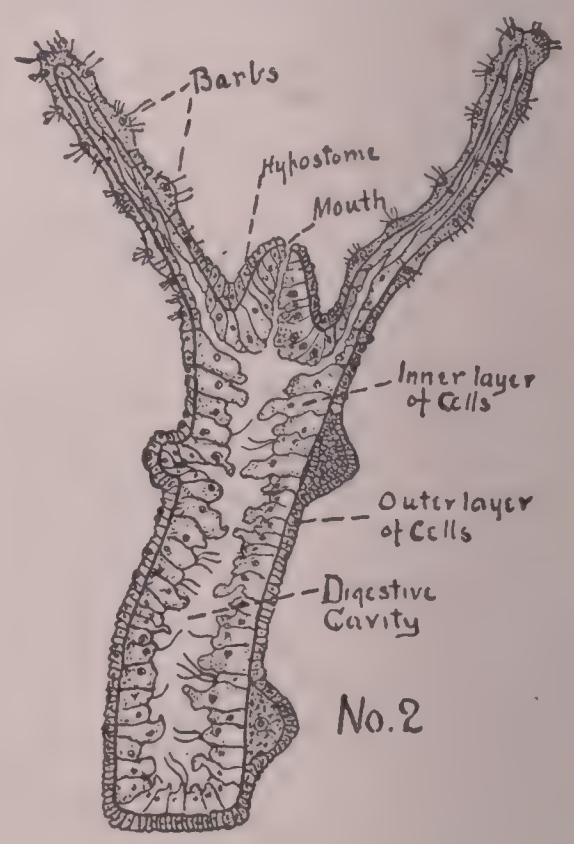
Hydra

Where the conical structure, known as the *hypostome,* joins the body, from six to ten long delicate tentacles, arranged in a circlet or whorl, are given off. The body is hollow, and contains a spacious cavity, which communi-



cates with the surrounding water by the mouth. The tentacles are also hollow, their cavities communicating with the body cavity. This is shown in No. 2.

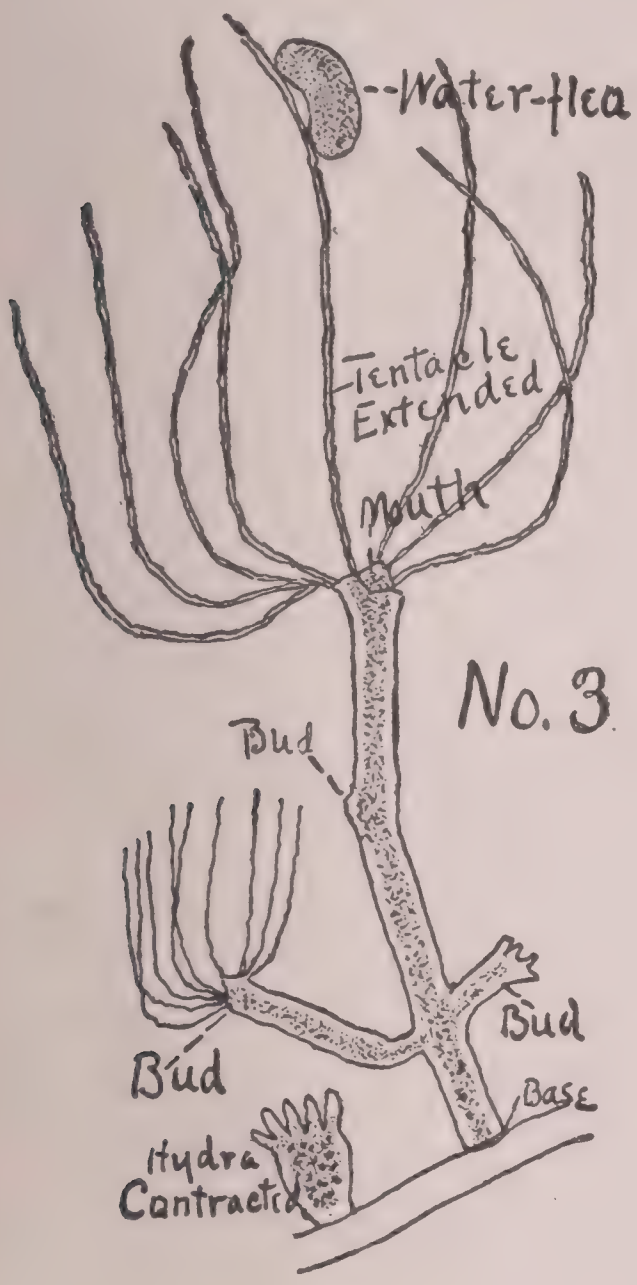
If the hydra is watched under a microscope, it will be noticed that the form is continually



changing. Sometimes it extends itself so much that its length is fifteen times its diameter, and the tentacles appear like long delicate filaments. This is shown in No. 3. At another time (as in No. 3), it contracts itself into an almost globular mass, and the tentacles then appear like little blunt knobs. Be-

sides these movements of contraction and expansion, the hydra is able to move slowly from place to place.

The hydra is a very voracious creature. In the water in which it lives are always to be found numbers of "water-fleas," which are very small and swim very rapidly. Occasionally one may be seen to come into contact with a hydra's tentacle as in No. 3. This



tentacle is a very innocent-looking affair, but it is very important to the hydra. As soon as one of the water-fleas comes in contact with the tentacles its swift swimming motions cease, and it acts as if it were dead. It remains adhering to the tentacle in a very mysterious manner. This is due to the fact that, secreted in the outer cells that cover the tentacles, there are some little sacks of fluid in which is a little barb. This little sac will not stand much pressure before it will explode, and when any little thing comes in contact with the outer surface of the tentacle the whole apparatus explodes like a harpoon-gun, and the little barb is literally shot into the body of the water-flea. When the sac explodes of course the liquid which it contained is freed, and this, probably containing some poison, follows the barb into the wound which has been made in the body of the water-flea, and thus the prey is secured. The tentacle is gradually contracted until the prey is brought near the mouth, the other tentacles being used also to aid in the process. The water-flea is forced against the lips of the mouth, which then expands widely and seizes it, and it is finally passed down into the central or digestive cavity.

The internal structure of the hydra is shown in No. 2. The digestive cavity, it will be noticed, is lined with cells, each consisting of protoplasm with a large nucleus. The cells are arranged in two layers round the central digestive cavity and the cavity of the tentacles. Between the two layers is a delicate transparent membrane. The structure of the hydra has been compared to a chimney built of two layers of radially arranged bricks with a space between the layers filled with mortar.

The cells in the digestive cavity contain a fluid used to aid in the digestion of the food. Some of the cells have little tail-like processes. (No. 2.) When the hydra swallows a water-flea or other particle of food the soft parts are dissolved by the digestive fluids, which are thus made ready to be taken up and incorporated into the structure of the cell. In this manner the cells grow, and consequently the animal.

When a hydra captures a particle of food too large to be taken into the mouth, it everts the endoderm so as to bring the digestive cells in contact with the food, but it speedily regains its original state; this explains the power it has of rapidly recovering after artificial inversion. Two hydra can be permanently fused with each other by pinning them together.

Hydra reproduces its own kind in two ways. One is by the process of budding and the other is sexual reproduction. In No. 1 some of the little buds may be seen. These buds are pushed out slowly, and finally small tentacles grow on the end, and at last it seems to drop off from the parent, and thenceforth leads an independent existence.

If a hydra be cut in two, it appears that within certain limits each portion will develop into a compiete animal; but the statement so often repeated, that when a hydra is turned inside out the endoderm and ectoderm will mutually take on each other's functions, and the animal continue to live, is erroneous.

Hydrangea (hī-dran′jēa), a genus of shrubs or herbs of the nat. order Saxifragaceæ, containing about thirty-three species, natives of Asia and America. The garden hydrangea is a native of China, and was introduced into Britain by Banks in 1790. It is a favorite for the beauty and size of its flowers.

Hydraulic Crane, a crane wrought by the pressure of water applied on the principle of the hydraulic or hydrostatic press. The mechanism consists of one or more such presses, with sheaves or pulleys and chains for the purpose of obtaining an extended motion in the chain from a comparatively short stroke of the piston. The power is applied not only for lifting the load, but also for swinging the jib, which latter object is effected by means of a rack or chain operating on the base of the

movable part of the crane, and connected either with a cylinder and piston having al-

Hydrangea.

ternate motion, like that of a steam engine, or with two presses applied to produce the same effect by alternate action.

Hydraul'ic Ram. See *Hydraulics.*

Hydraulics is that branch of science which treats of fluids, particularly of water, in motion. As a branch of engineering, it treats of the practical application of the mechanics of fluids to the control and management of water, more especially to canals, waterworks, hydraulic machines, pumps, artesian wells, water wheels, water motors, turbines, dams, and water power. Hydraulic "power" so called, is the energy, the capacity for work, found in pressure transmitted by water inclosed in pipes, cylinders, etc. Pressure, exerted on a certain area of water which is enclosed in a vessel, is transmitted to every equal area of the interior of the vessel, and the whole pressure may be increased in proportion as the area of the external pressure area is decreased. On this principle hydraulic presses, lifts, jacks, rams, punches, rail benders, shears, elevators, etc., are operated. The hydraulic engineer, also has to do with water wheels, such as turbines, breast wheels, undershot wheels, overshot wheels, water motors, and engines. Hydraulic "power" is the application of pressure through water, but as pressure is equal in all parts, and in all directions, area for area, an increased pressure can be obtained by giving a larger area to the working area against which the pressure is directed. In this way a small pressure at one end is magnified into a greater pressure at the other end. For instance, if two cylinders, each with a movable piston, are connected with a pipe, and both cylinders and pipe are filled with water, and the smaller piston has an area of 1 sq. in., and the larger piston has an area of 4 sq. in., then one pound pressure exerted by the smaller piston is transmitted through the water to each square inch area of the larger piston, resulting in an aggregate pressure of four pounds. If the larger

piston has an area of 1,000 or 5,000 or 10,000 sq. in., the aggregate pressure is 1,000, 5,000 or 10,000 pounds. The Bramah hydraulic press is regarded as the first practical application of what is known as "hydraulic power." In the museum of the commissioner of patents, England, is the first Bramah press ever made. It is dated 1796, and it is the simplest form of a hydraulic press. It consists of a reservoir of water, above which is a hand pump. From the barrel of the pump, which is a force pump, a pipe leads to a vertical cylinder. Operating in this cylinder is a piston, moving up and down. The piston rod extends upward, and on it is a table which works between upright guides like an elevator. Over the table is a plate, rigid and strongly braced to withstand an upward pressure. The force pump exerts a pressure, through the pipe, upon the water in the press cylinder. The pressure forces the piston, piston rod, and table upward, and the power developed is proportionate to the respective areas of the pump and cylinder, and the speed of elevation of the table is proportionate to the quantity of water injected.

With the Bramah hydraulic press as a beginning, the powerful and elaborate hydraulic presses of modern days were developed. The hand pump was replaced, first by a steam pump which forced water into a tank placed at an elevation. This gave a natural head which gave pressure in proportion to the height of the reservoir tank above the working cylinder. Thus a column of water, 1,500 ft. high, gave a pressure of 660 pounds to the sq. in., and the pressure was constant. Sir William Armstrong, in the first application of "hydraulic power" to cranes, used a natural head, pumping water into tanks 200 ft. above the working cylinder of the press. He improved on this system by using an accumulator which not only gave him a capacity for increased pressure, but reduced the cost of construction.

An accumulator, in its simplest form, consists of a cast-iron cylinder fitted with a water tight plunger. This plunger works pistonwise, in the upright cylinder. The plunger is weighted with bricks, broken pig iron, lead pigs, and other forms of weight. The pump forces water into the piston, and the weighted plunger rises, when the cylinder is filled with water, a lever, actuated by the rising plunger, shuts off the steam from the supply pump. From the cylinder of the accumulator, a pipe or pipes lead to the working cylinders of the hydraulic press or presses connected with the accumulator, for more than one press, crane, or hydraulic machine can be operated from the accumulator. When the cranes, presses, etc., are in operation, the plunger descends. In descending it opens the throttle valve of the steam supply pump and the pump begins sending water into the cylinder again. In this way a constant even pressure is automatically maintained.

Hydraulic machines are slow in speed, for an increase of power is always obtained at the expense of a decrease in speed, but by multi-

plying the force, the produced working pressure can be immensely magnified; hence "hydraulic power" is regarded as the most powerful that can be secured. It is said that by the application of the principles underlying "hydraulic power," the weight of a baby's hand can be made to lift the largest ship that sails the ocean. One of the most ponderous hydraulic presses in the world is a forge press in Sheffield, England. It operates under a pressure of 5,000 pounds to the sq. in., and turns out steel forgings of any size up to 150 tons each. Forge presses for doing the same kind of work are used in iron works of the U. S. on armor plate and cannon, the heaviest steel shafting, and for compressing steel castings while yet in the fluid form. Such presses are immense pieces of machinery, massive in all their proportions, molding and shaping iron and steel weighing 200,000 and more pounds to the piece, yet obeying the slightest turn of a hand valve.

Passenger and freight elevators are raised and lowered by hydraulic rams, whose slow motion is changed to a high speed by a system of pulleys and tackles. The accumulators for these rams are tanks of water placed on the roof of the building. Hydraulic presses rivet boiler plates, press out kitchen sinks, bath tubs, shovels, and other shapes from a single sheet of steel; operate the converters, platforms, and cranes in a Bessemer steel works; press hats into shape; cut out soles from leather; form bricks; press out oil from peanuts, lard, cotton seed, etc.; elevate, turn, and depress 100-ton guns aboard ships; raise buildings and railroad tracks; swing and lift movable bridges; make lead pipe; shove ahead the cutting shield used in excavating tunnels; lift ships in dry docks, and perform a thousand other things where immense, steady, and reliable power is an essential requisite.

Hydraulic Ram.—Another form of hydraulic ram is a device by which the fall of a column of water in a pipe is used to lift a portion of itself to a height greater than its source. This can only be done with a waste of water, therefore a hydraulic ram is never used except where there is more water at command than is necessary to raise. Montgolfier, one of the inventors of the hot air balloon invented the self-acting hydraulic ram in 1796, and for his invention received a gold medal at the French Exposition of 1802.

The hydraulic ram operates to lift water because the momentum imparted to water in falling, is sufficient to carry it to a height, just as much greater than that of the falling column of water, as the quantity of water in the former is less than in the latter. In practise the water flows down a pipe which is connected with a chamber at the bottom of which is an uplifting valve. The supply pipe continues past this valve, but has at its end another valve, which normally is open, allowing the water to flow free without going into the chamber of the ram. But the velocity of the water, running down the supply pipe, is sufficient to close the end valve. This causes a

reaction, and the reaction opens the valve which connects the supply pipe with the chamber of the hydraulic ram. The water flows into the chamber, compressing the air. Having spent its energy in forcing part of itself into the air chamber, the back pressure ceases, the valve at the free end of the supply pipe opens, and the water flows past the chamber. But it gathers velocity, and soon closes the end valve, and again forces part of itself into the air chamber. This forces the water from the chamber into the outlet pipe, and this series of operations, in time, causes the water to be lifted to the height of consumption.

See *Turbines* and *Water Wheels.*

MALCOLM MCDOWELL.

Hydrocarbons, in chem., a series of compounds which consist of carbon and hydrogen only. They are produced chiefly by the decomposition of organic substances, either slowly by natural causes, or by artificial means, as in the case of the destructive distillation of coal for the purpose of making gas. Certain of the hydrocarbons are also found in the gums which exude from trees. Among the best known are paraffin, benzine, and turpentine.

Hydrochloric Acid (or Muriatic Acid), a gaseous compound of equal volumes of hydrogen and chlorine. It is evolved during volcanic eruptions, and is found in the water which collects in the crevices of mountains, as well as in rivers which take their rise in volcanic formations, especially in South America. It may be produced by decomposing common salt with sulphuric acid, or by bringing equal volumes of chlorine and hydrogen together and exposing the mixture to diffused daylight without condensation. It explodes in direct sunlight. Hydrochloric acid is colorless, has a pungent odor, and an acid taste. It is quite irrespirable, extinguishes flame, and dissolves very readily in water. The chief use of hydrochloric acid in the arts is to supply chlorine to the bleaching powder manufacturer. It is also used in the preparation of glue, phosphorus, carbonic acid, artificial waters, etc. In medicine it is used diluted as a tonic and astringent. In a concentrated form it is a powerful caustic.

Hydrodynam'ics, a branch of the general science of dynamics, treating specially of the laws of force as applied to fluids. It is divided into *hydrostatics*, which is concerned with forces applied to fluids at rest, and *hydrokinetics*, which treats of the application of forces so as to produce motion in fluids. The term hydrodynamics is, however, very often used in the latter sense, being thus opposed to hydrostatics. The name *hydraulics* is given to the subject when considered with respect to its practical bearing on engineering science.

Hydrofluor'ic Acid (or Fluohyric Acid), an acid which may be obtained either in the liquid form or in the anhydrous form, as a colorless gas. Both the dry and the liquid form act upon the skin with great virulence. Hydrofluoric acid is used chiefly for etching upon glass. The glass is covered with a thin coating of etching wax, and the design is

traced through the wax down to the glass with a fine-pointed instrument. The plate is then treated either with an aqueous solution of the acid or is exposed to the gas itself. After a sufficient length of time the wax is dissolved away and the design becomes visible. In chemistry, hydrofluoric acid is used to decompose and dissolve silicates in mineral analysis.

Hy′drogen, an important elementary substance, one of the elements of water and a component of all vegetable and animal products. It may be obtained by passing the vapor of water over red-hot iron filings, or by submitting water to the action of an electric current, whereby it is decomposed into its elements hydrogen and oxygen. Pure hydrogen is a colorless, tasteless, inodorous gas; it is very inflammable, burning with a pale, very slightly luminous, but intensely hot flame; it is a powerful refractor of light; the least dense and the most rapidly diffusible of all the gases and the lightest body in nature, being about 14½ times lighter than atmospheric air, with a specific gravity of .0693. In consequence of its extreme lightness it is the recognized standard of unity in referring to the atomic weight of bodies, and it has also been assumed as the unit in speaking of the specific gravity of gases, although common air is the more generally received standard. Hydrogen cannot support respiration, but is not directly poisonous, death ensuing from mere absence of oxygen. Two volumes of hydrogen with six of air form an explosive mixture. The most intense heat that can be produced is caused by the burning of hydrogen in oxygen gas, and this principle has been applied to increase the temperature of blast furnaces in iron works by making the gases pass separately through heated tubes to the furnace. Hydrogen is only slightly soluble in water, nor is there any other liquid which is capable of dissolving it in great quantity. Hydrogen gas can be liquefied by exposure to 650 atmospheres pressure and –140°C., but remains liquid at 320 atmospheres pressure, the temperature remaining the same. It unites with all other elementary gaseous bodies, and forms with them compounds, not only of great curiosity but of vast importance and utility; with nitrogen it forms ammonia; with chlorine, hydrochloric acid, with fluorine, hydrofluoric acid, etc.

Hydrog′raphy, that branch of geographical science which has for its object the description and natural phenomena of the water of the surface of the globe, whether in seas, lakes, or rivers. It may deal with the rivers, watersheds, lakes, etc., of a particular country; and it also embraces the determination of winds, currents, and other departments of marine surveying. In Britain, France, the U. S., etc., there are hydrographic departments kept up by government, which publish accurate charts of coasts, issue sailing directions, etc.

Hydrom′eter, an instrument primarily for determining the specific gravity of fluids, though some of them can also determine the specific gravity of solids. The hydrostatic principle on which the use of the hydrometer depends is the well known one that when a solid body floats in a liquid, and thus displaces a quantity of the liquid, the weight of the solid body is equal to the weight of the liquid that it displaces. The density of the liquid is determined either by observing the depths to which the hydrometer sinks in the liquid (the hydrometer of variable immersion) or the weights required to make it sink to a given depth (the hydrometer of constant immersion). Of the second kind of hydrometer Nicholson's is a good example. It consists of a hollow cylinder of metal, surmounted with a very fine metallic stem, to the top of which there is attached a plate or pan for weights. From the bottom of the metallic cylinder hangs a kind of cup or basket. The whole instrument is weighted so as to float upright. On the fine metallic stem there is a marked point, and by putting weights on the upper pan the hydrometer is always made to sink precisely to this point. thus the volume immersed is always the same. From what was said above, it is seen at once that different weights are required to sink it to the marked point in different liquids, the denser the liquid the greater being the weight required; and if the weight of the instrument itself is known, and also the *standard weight*, or weight required to sink it to the marked point in distilled water, the calculation of the specific gravity of any liquid, from an observation with the instrument, is very easy. But the specific gravity of solids can also be found by means of Nicholson's hydrometer, for which purpose the instrument is placed in distilled water and the solid body is put on the upper pan. Weights are then added till the hydrometer sinks to the marked point. But the *standard weight* of the instrument being known, it is plain that the difference between it and the weights that must be added on the upper pan to the weight of the body whose specific gravity is to be determined must be the weight in air of that body. The body is now transferred to the basket below the instrument, and the additional weights which must now be placed in the dish represent the weight of water displaced by the solid; and the weight of the solid itself divided by this weight is the specific gravity required. Hydrometers of variable immersion are usually made of glass. Each of them has a large hollow bulb, below which there is a smaller bulb weighted with mercury to make the instrument float upright. The stem is cylindrical and is graduated, the divisions being frequently marked on a piece of paper inclosed within the stem. The depth to which the hydrometer sinks in the liquid gives the density.

Hydropho′bia, a specific disease arising from the bite of a rabid animal. The animals most liable to be afflicted with madness are dogs; but cats, wolves, foxes, etc., are also subject to it. The treatment consists in preventing its development, which may be effected by applying a ligature, where possible, to impede the circulation from the wound, by sucking it, and thoroughly cauterizing it

either with nitrate of silver or with iron heated to a white heat, the pain of cautery being less as the temperature is greater. If these means are not available, any burning substance and most acids may be used. M. Pasteur discovered a method of preventing the development of the disease by a system of successive inoculations with rabid virus of greater and greater intensity; the inoculation being made the first day with marrow which has been extracted from the rabid animal 12, 10, and 8 days; then the second day with marrow extracted 6, 4, and 2 days; the third day with one day's marrow, etc.

Hydrostat'ic Press (or Bramah's Press), a hydrostatic apparatus which in its practical application was invented by Bramah in 1796. It was the invention by Bramah of a watertight leather collar surrounding the piston that made the use of the press practicable; before his invention not much power could be developed from the escape of the water round the piston. The collar consists of a leather ring bent so as to have a semicircular section, so that the water passing between the piston and cylinder fills the concavity of the collar, and by pressure produces a packing which fits the tighter as the pressure on the piston increases. The hydrostatic press may be constructed to give pressures of two or three hundred tons, and is extensively employed where very great force is required, as in testing anchors or raising very heavy weights.

Hydrostat'ics is that part of the general science of hydrodynamics that treats of the application of forces to fluids at rest. Among the chief principles of hydrostatics may be mentioned the following: 1, The intensity of pressure at any point of a fluid is the same in all directions; it is the same whether the surface that receives the pressure faces upward, downward, horizontally, or obliquely. 2, When a fluid is confined, if the intensity of pressure in one part be increased, as by forcing in a piston, or by any other means, an equal increase will be produced in the intensity of pressure at all other parts; in other words, pressure applied to any one part is transmitted without any change in its intensity to all other parts. 3, Not only is pressure transmitted out to the surface or envelop of the liquid, but within the fluid itself the particles are all pressed together. When a solid is immersed in the liquid it is pressed at every point of its surface in the direction perpendicular to the surface at that point. 4, In every horizontal layer throughout the liquid the pressure per unit area is the same; and this is the case independently of the shape of any vessel in which the liquid may be contained. The pressure per unit area in any horizontal layer depends only on the height of the free surface of the liquid above the layer considered, and the specific gravity of the liquid; and it is equal to the weight of a column of the liquid of unit sectional area whose height is the height of the free surface. Hence whatever be the shape or size of several vessels, if all have the same area of base, and if in all the water stands at the same height, the pressure on each of the bases is the same. 5, When a solid is immersed either partially or wholly in a liquid a portion of the liquid is displaced. The solid is at the same time pressed at every point by the liquid. But the upward pressure on the solid is greater than the downward by an amount equivalent to the weight of the liquid displaced by the solid. Hence we obtain what is called the principle of Archimedes, namely, that a body immersed either wholly or partially in a fluid loses a portion of its weight equal to that of the fluid which it displaces. This principle is of great importance as regards the floatation of bodies, and the determination of specific gravity, etc. In regard to the sinking or floating of bodies three different cases may thus arise: First, the weight of the body may exceed the weight of the liquid it displaces, in which case the body sinks in the liquid. Second, the weight of the body may be less than that of the liquid displaced, in which case the body will not remain submerged unless forcibly held down, but will rise to the top and partly out of the liquid until the weight of the liquid displaced is equal to its own weight. Third, the weight of the body may be equal to the weight of the liquid displaced, in which case it will have little or no tendency either to sink or rise.

Hydrosulphu'ric Acid, or sulphuretted hydrogen or hydrothionic acid is a colorless, inflammable gas produced by the putrefaction of sulphurous organic matters. Many mineral waters contain it naturally. It may be artificially produced by burning sulphur vapor in hydrogen, or by passing hydrogen through sulphur. It has a sweet taste but a very nauseous odor as of rotten eggs. It has poisonous effects when breathed, and experiments have shown that birds perished in air which contained $\frac{1}{1500}$th part of the gas.

Hydrothor'ax, a dropsical condition of the pleura, in which the pleural cavity contains a serous fluid exuded from the blood-vessels, not due to inflammation. It may be the result of organic disease in the heart or kidneys, or of pressure on vessels obstructing the return of blood.

Hydrozo'a, a class of animals of the subkingdom Cœlenterata, in which the walls of the body inclose a simple undivided cavity which acts both as a body cavity and a digestive cavity. The body is essentially composed of two layers, an outer layer or ecto-

a.—*Syncoryne frutescens* (reduced); *b.*—branch of same (magnified); *c.*—*Sarsia*, Medusa of same, shortly after liberation. (After Allman.)

derm and an inner or entoderm. Reproductive organs are developed as external processes of the body-wall, but reproduction also takes place by fission. The hydrozoa are all aquatic and almost all marine. The fresh-water hydra is a very good type of the class. The body is quite soft, and when fully contracted appears like a particle of matter resting on the surface of a plant or stone; but when expanded it shows a long, slender body of a bright green or light brown color. One end of the body developes into a number of long, slender tentacles, within which, near their bases, the mouth of the animal is found. This is the *distal* or free-growing end. The other and more slowly growing end is known as the *proximal*, and ends in a kind of disc or foot by which the hydra attaches itself to objects. The body is hollow from one end to the other. It is found most in semi-stagnant waters, where, hanging from its foot-disc, with its long tentacles expanded, it seizes on the small crustaceans or other suitable prey which comes in contact with it. Its tentacles have a stinging power which soon paralyzes its prey. Under favorable conditions one or more hydræ are usually found attached to the parent form. Such are produced by a process of budding from the parent. Each of these ultimately separates from the parent stem and becomes an independent hydra. The Hydrozoa are divided by Professor Nicholson into six subclasses, viz., the Hydroida, the Siphonophora, the Lucernarida, the Graptolitoidea, the Hydrocorallinæ, and the Stromatoporoidea.

Hye′na, a genus of digitigrade, carnivorous quadrupeds, constituting a family which unites the skull characters of the Felidæ (cats) with the skeleton and gregarious habits of the Canidæ (dogs). The characters of this genus are five molars above, and five or four below, on each side, the three anterior molars being conical, smooth, and remarkably large, adapted

Spotted Hyena.

for breaking the bones of their prey; the tongue is rough; the legs are each terminated by four claws; the fore legs are longer than the hind legs; the eyes large and prominent; the ears long and acute; the jaws are remarkable for the strength of their muscles, and can crush the hardest and most massive bones with ease. The genus is confined to Africa and Asia. There are three species known—the striped hyena, the spotted, and the brown hyena. They are nocturnal animals, extremely voracious, feeding chiefly on carrion, and thus being of great utility in the countries where they live; to obtain dead bodies they will even dig up graves. Along with the true hyenas, the aard-wolf of South Africa is also included in the family of Hyænidæ. An extinct species, the *cave hyena*, was abundant in England, France, and Germany anterior to the glacial epoch, and has left its remains in many caves of these countries.

Hygeia (hī-ji-ē′ya), the Greek goddess of health, daughter of Asclepius, or Æsculapius. Her temple was placed near that of Æsculapius, and her statues were even erected in it. She is represented as a blooming maid with a bowl in her hand, from which she is feeding a snake, the symbol of health.

Hygrom′eter, an instrument for measuring the degree of moisture of the atmosphere. The chief classes of hygrometers depend either upon absorption or upon condensation. Of the former kind is the hygrometer of Saussure, in which a hair, that expands and contracts in length according as the air is more or less moist, is made to move an index. Of the latter sort is Daniell's hygrometer.

Hy′men (Hymenæ′us), the god of marriage in Grecian mythology. No marriage took place without his being invoked to sanction it. He is described as having around his brows the flowers of marjoram, in his left hand the flame-colored nuptial veil, in his right the nuptial torch, and on his feet golden sandals. He is a taller and more serious Eros, and is accompanied by a song and dance.

Hypa′tia, a Greek female philosopher of the eclectic school, the daughter of Theon, a celebrated astronomer and mathematician of Alexandria toward the close of the fourth century after Christ, at which period she was born. Her father taught her not only all the branches of polite learning, but also geometry, astronomy, and finally philosophy. She acquired a great reputation in the latter study, and as a preceptress in the school of Plotinus gathered a numerous auditory of students from all parts of the East. She was as virtuous and beautiful as she was learned. But the jealousy and intolerance of Cyril, the Patriarch of Alexandria, were aroused at the influence exercised by Hypatia; the lower and more ignorant clergy in particular were stirred against her, and at length a number of them, having excited a popular tumult, seized her as she was returning from the schools, dragged her through the streets of Alexandria, stripped her, and finally murdered her with circumstances of the greatest barbarity (415).

Hyperion (hī-pēr′ī on or hī-pē′ri-on), in the most ancient mythology of Greece, the god of the sun, afterward identified with Apollo; also one of the Titans.

Hypoder′mic Injections, injections of some substance beneath the skin; a method adopted in medicine when the condition of the stomach or other organs renders the use of drugs by the mouth objectionable, or when rapidity of

action is desired. The medicine is introduced by a small glass syringe fitted with a long, hollow, needle-shaped point of steel.

Hypoth'esis, etymologically a supposition, is popularly used to denote something not proved, but assumed for the sake of argument. In scientific and philosophical usage it denotes either a probable theory of phenomena not yet fully explained, or a strictly scientific theory which accounts for all the known facts of the case, and which only needs the verification of subsequent observations and deductions to become a certainty. Thus the conjecture of Newton that the force of gravity, as exemplified on the earth, might extend to the moon, was in its first stage a probable hypothesis; but when it was found to account for all the facts, it became a scientific hypothesis or theory.

Hyrax.

Hy'rax, a genus of pachydermatous mammalia, intermediate in their character between the rhinoceros and the tapir. It is the only genus of the order Hyracoidea, characterized by having no canine teeth, but long, curved incisors. The front feet have four toes, and the hind feet three. The Cape hyrax is by the colonists of South Africa called *Rock-badger* and *Rock-rabbit.*

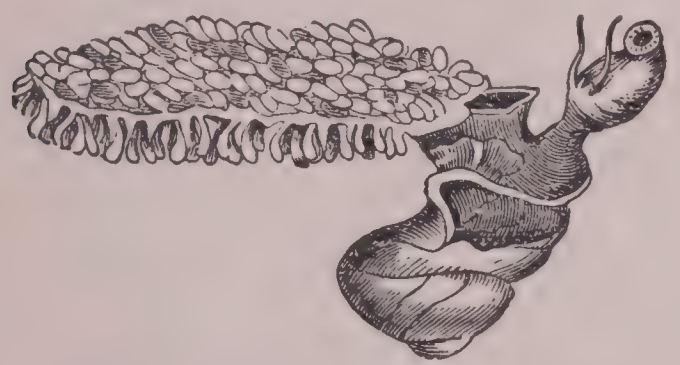
Common Hyssop.

Hyssop, a genus of plants of the natural order Labiatæ. The common hyssop is a perennial shrubby plant rising to the height of two feet, a native of Siberia and the mountainous parts of Austria, but common in our gardens. It flowers from June to September. The leaves have an agreeable aromatic odor, and a slightly bitter and somewhat warm taste. It was once esteemed as a medicine, but has now fallen into disuse. The hyssop of Scripture (the symbol of spiritual purification from sin) is generally identified with the caper.

I

I, the ninth letter and the third vowel of the English alphabet, in which it represents not only several vowel sounds but also the consonantal sound of *y*. The two principal sounds represented by it in English are the short sound as in *pit*, *pin*, *fin*, and the long as in *pine*, *fine*, *wine*, the latter being really a diphthongal sound. It has also three other sounds, viz., that heard in *first*, *dirk* (ė, the neutral vowel); that heard in *machine*, *intrigue* (which, however, can scarcely be considered a modern English sound); and the consonant sound heard in many words when it precedes a vowel, as in *million*, *opinion*, *trunnion*. I and J were formerly regarded as one character.

Ian′thina (Gr. *ianthinos*, violet-colored), a genus of oceanic, gasteropodous mollusca,



Violet Snail: Shell, Animal, and Raft.

with a thin, violet-colored snail-like shell. When irritated they pour out a violet secretion, which serves for concealment, in the manner of the ink of the cuttlefish.

Ib′adan, a town of Western Africa, in the Yoruba country, about 70 mi. n. of the Bight of Benin. Pop. 100,000.

Ibague (ē-bȧ-ga′), a town of South America, Republic of Colombia, department of Tolima. Pop. 10,000.

Iber′ra, a town of Ecuador, South America, capital of the province of Imbabura, at the foot of the volcano of the same name, 30 mi. n. of Quito. Pop. est. at 10,000.

Ibar′ria, in ancient geography: 1, A fertile district in Asia, between the Black and Caspian seas, which consisted of a plain surrounded by mountains, a part of modern Georgia. 2, An ancient name of Spain, from its river, the *Ibērus* (Ebro). The Iberi, or Iberians, probably the most ancient European nation, formed the basis of the population of Italy, Gaul, Spain, and Lusitania (Portugal). Their language still lives in the Basque. The Celts, who entered the country later, were intermingled with them, the conjoined people being called Celtiberians.

I′bex, a name of two or three species of goats. The horns of the male are flattened, have two longitudinal ridges at the sides, and are crossed by numerous transverse knots. The horns of the female are short, more erect, with three or four knots in front.

Ibicui (ib′i-kwi), a river of Brazil, which rises in the Serra de Santa Anna, province of Rio Grande do Sul, and joins the Uruguay at Yapeyu after a course of 400 miles.

Ib′igau, a very large goatsucker, inhabiting South America; sometimes called the *grand goatsucker*.

I′bis, a genus of birds allied to the storks, the most remarkable species being sacred ibis. This is found throughout Africa. It is about the size of a common fowl, with head and neck bare, and white plumage, the primaries of the wings being tipped with black, and the secondaries being bright black, glossed with green and violet. It was reared in the temples of ancient Egypt with a degree of respect bordering on adoration, and after death was preserved in a mummified condition. The cause of its being deemed sacred was no doubt because it appeared in Egypt with the rise of the Nile; but it is now rare in that country, living farther south. There are several other species, as the glossy ibis, nearly 2 ft. in length, which builds in Asia, but migrates also to Egypt, sometimes visiting England; the *I. rubra* of tropical America, remarkable for its scarlet

The Sacred Ibis.

plumage; the white ibis of Florida; the straw-necked ibis of Australia, etc.

Ibrahim Pasha (1789–1848), adopted son of Mehemet Ali, viceroy of Egypt. He first gave signal proofs of his courage and military talents in the war with the Wahabis of Arabia, whom he completely defeated, and in the subjugation of Sennaar and Darfur. To effect his father's purpose of making Syria a bulwark to his new Egypto-Creton kingdom he in 1831, crossed the Egyptian frontiers with an

army, overran Palestine, took St. Jean d'Acre by storm, and made himself master of all Syria. By the interference of the great powers Ibrahim was eventually obliged, after retiring from all his Syrian conquests, to return to Egypt, marching across the desert from Damascus with great loss and suffering. From this time he appeared seldom in public life, and employed himself chiefly in the improvement of his own estates. In 1846 he visited England and France. In 1848 Ibrahim, after his father had become superannuated, proceeded to Constantinople, and was nominated Viceroy of Egypt, but he died in the same year at Cairo, while Mehemet Ali was still alive. He was succeeded by Abbas Pasha, the favorite grandson of Mehemet Ali.

Ib'sen, HENRIK, Norwegian dramatist and lyric poet, b. in 1828. His first play, *Catilina*, was produced in Christiania in 1850. He was successively director of the theater at Bergen, and of the Norske Theater at Christiania, which he managed in 1857–62. In 1864 he left his native country and since then has resided chiefly abroad. His dramas are partly in prose, partly in verse, and include historical plays and satirical comedies of modern life. Some of them have been represented in English. Ibsen is also a lyric poet of repute. In 1866 he obtained a pension from the Storthing.

Ib'ycus, a Greek lyric poet, b. at Rhegium, Italy, in the sixth century B.C.; lived mostly at Samos in the court of Polycrates. It is related, that while on a journey he was surprised and murdered by robbers near Corinth. Finding escape impossible, he declared that the cranes, which happened to be flying over their heads, would avenge his death. The robbers afterward seeing a flock of cranes, one of them said involuntarily, "Behold the avengers of Ibycus." They were in consequence seized, and, after confessing their crime, were executed. His writings are known only by fragments. His poetry was chiefly erotic, but sometimes mythical and heroic.

I'ca, a coast department of Peru, area 6,295, pop. 60,111. Its capital, Ica, lies in the fruitful valley of the River Ica; pop. 7,000.

Ice, water frozen into a solid mass. Water freezes when its temperature is reduced below a certain point, which is by universal consent made a fixed point on thermometers. That point is called zero on the Centigrade and Réaumur scales, and 32° on the Fahrenheit scale. Water near the freezing point presents the curious anomaly of expanding instead of contracting as the cooling process goes on. At 4°.1 Centigrade (39°.4 F.) water has its maximum density point. At temperatures below 4°.1 the volume of the water increases as the temperature falls, and decreases as the temperature rises; and at the moment of solidifying the volume of the mass suddenly increases to a very considerable extent, so that ice at the temperature of freezing is one ninth greater in volume than the water from which it is formed is at 4°.1. It is on this account that water freezes at the top first, and that ice when frozen floats at the top of the water. The temperature at which pure water becomes ice is very nearly constant under ordinary circumstances; and it is this fact, along with the ease of procuring water at the freezing temperature, or rather ice at the point of liquefaction, that has caused this temperature to be adopted as one of the fixed points in thermometers. The freezing point is, however, slightly influenced by pressure. Increase of pressure lowers it, and the removal of pressure raises it. Salt water requires a lower temperature to freeze it than fresh water, and in the process a large part of the salt is rejected, Hence water obtained from the melting of sea-ice is nearly fresh. If water is kept perfectly at rest it may be reduced in temperature far below the freezing point without turning into ice; but particles of solid matter such as dust must also be kept from falling into it. The expansion of water on its conversion into ice often gives rise to the exhibition of very great force, and produces very remarkable effects in nature. Much of the disintegration observed in rocks and stones during or immediately after frost is due to it, water having entered into their pores and cavities and burst off particles by its expansion. Ice, though it is very hard and brittle, possesses the property of plasticity to a very remarkable degree, and can be molded into any form by the application of pressure. The plasticity of ice is a property of very great importance. It was discovered by Forbes, who explained the motion of glaciers by it. In nature ice appears in the greatest masses in the form of glaciers and icebergs, the latter being portions which have become detached from glaciers that extend down into the sea. Ice is now an article of considerable importance from a commercial point of view, large quantities of it being shipped to warm climates from countries where it is naturally produced in abundance in winter.

That ice could be produced by means of machinery has been known to science for a half-century, but it is only within the last few years that artificial ice making has become practical. The process consists in simply permitting pure liquid ammonia to evaporate or expand inside of iron pipes which are coiled in tanks filled with salt brine, which gives up the heat required by the ammonia in evaporating and thus lowers its temperature below the freezing point. The fresh water to be frozen is in smaller cans which are surrounded by the brine. For the manufacture of ice there must be a combination of steam boiler, pumps, condensers, tanks, pipes, and other machinery. The pump is the principal piece of machinery in an ice-making factory. Its office is to suck in the anhydrous ammonia gas with one stroke of the piston and with the next to compress the gas to a liquid. The ammonia is used over and over again, first as a liquid, then as a gas freezing the water, and back into a liquid again. Ammonia gas is liquefied by pressure and also by cold. The pump forces the gas into the condenser—a series of coils of small pipe over which water

is constantly flowing. The gas pressed into the smaller pipe turns to liquid ammonia which flows into a storage tank through pipes leading from the condenser, thence into two large vertical cylinders, and from there into the expansion coils which lie in the bottom of the freezing tanks. The pipes of the expansion coils are much larger than the pipes of the condenser and the liquid ammonia expands and evaporates as it moves along, keeping the salt water or brine in the freezing tanks at a temperature of 18° or colder. In the manufacture of artificial ice, pure water is used. The water is filtered and distilled, and sometimes boiled. The freezing tanks are made of iron set below the floor in order to facilitate the handling of the ice. The large tanks are about 50 ft. long, 20 ft. wide, and 4 ft. deep. The cans containing the pure water are 44x22x11 in. in size. The pipes which contain the ammonia go back and forth across the tank between the cans and the salt water is kept in motion by an agitator. The cans are filled from the pure water tank by means of a hose which has a nozzle that lets the water into the cans but keeps air bubbles out. It requires from 48 to 60 hours to freeze solid the water in the cans. After the water is frozen in the cans it is taken from the tank and carried by means of a traveling crane to the ice house; here tepid water is poured upon the can until the ice drops out. The can is then taken back, filled with water and dropped into the tank again, and the ice cake is stored in the ice house. Some ice factories use sulphurous oxide instead of anhydrous ammonia and have a brine made of magnesium chloride instead of salt. In other respects the two processes are practically the same. The principle of making ice is applied in shafts or tunnels which are being executed through quicksands. The plant is in the surface or at the mouth of the tunnel and from it brine chilled to about zero is sent through pipes to the place of working. Pipes are driven ahead of the work into the quicksand and the circulating brine freezes the loose ground into a hard cylinder. Thus the quicksand is kept out until the brick is laid in.

An Iceberg, showing proportion under water.

Icebergs, large masses of ice which have become detached from the shores of the arctic regions, and float about in the ocean at the mercy of the winds and currents. They are in fact pieces of glaciers detached from the parent mass by the action of the sea and by their own accumulating weight. They present the strangest and most picturesque forms, are sometimes miles in length, and rise to a height of perhaps 250 or 300 ft. above the sea, the portion above water being calculated at about an eighth of the whole. Icebergs consist of clear, compact, solid ice, with a bluish-green tint, Their cavities contain fresh water, from the melting of the ice. They are frequently encountered in the North Atlantic (of course in the Southern seas as well), and have caused many a wreck. The ice that forms on the surface of the sea, called *field ice*, is porous, incompact, and imperfectly transparent. The field ice forms in winter and breaks up in summer. A small field is called a *floe;* one much broken up forms a *pack.*

Iceland, an island belonging to Denmark, situated between the North Atlantic and the Arctic oceans, 250 mi. from Greenland and about 600 mi. w. of Norway; greatest length, e. to w., 300 mi.; central breadth, about 200 mi.; area with adjacent isles, 40,000 sq. mi. Among the volcanoes the most celebrated is Mount Hecla, in the s., about 5,000 ft. high. Numerous hot springs or *geysers* are scattered throughout the island, but are found more especially in the southwest, to the northeast of Reikjavik. There are numerous lakes and rivers. The most valuable mineral product is sulphur, of which the supply appears to be inexhaustible; the other minerals deserving of notice are chalcedonies, rock crystals, and the well known double refracting spar, for which the island has long been famous. There is a kind of brown coal which to some extent serves as fuel. The climate is mild for the latitude, but the summer is too cool and damp for agriculture to be carried on with much success. Vegetation is confined within narrow limits. Almost the only tree is the birch, which has a very stunted growth, the loftiest of them hardly exceeding 10 ft. There are various flowering plants, among which saxifrages, sedums, thrift or sea pink, etc., are common. Heath and bilberry cover large stretches. Among mosses or lichens are the edible Iceland moss (which see). Cole, potatoes, turnips, radishes, and similar roots thrive tolerably well. But by far the most valuable crop is grass, on which considerable numbers of live stock (sheep, cattle, ponies) are fed. The reindeer, though not introduced before 1770, has multiplied greatly and forms large herds in the interior; but they are of little importance economically. Wild fowl, including the eider duck whose down forms an important article of commerce, are abundant; the streams are well supplied with salmon, and on the coasts valuable fisheries of cod and herrings are carried on. Manufactures are entirely domestic, and consist chiefly of coarse woolens, mittens, stockings, etc. The exports are wool, oil, fish, horses, feathers, worsted stockings and mittens, sulphur, and Iceland moss.

The inhabitants are of Scandinavian origin, and speak a Scandinavian dialect, which still

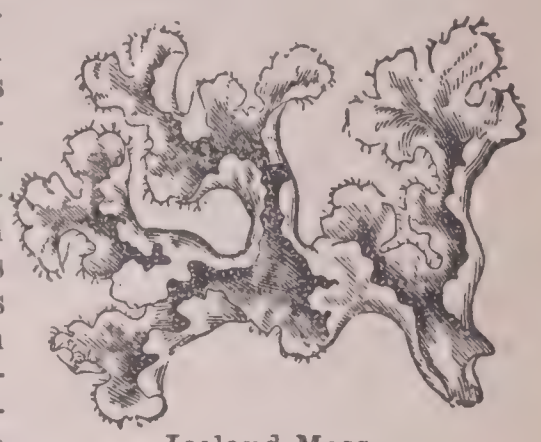
represents the old Norse or Norwegian in great purity. They are of the Protestant religion. Iceland has a constitution and administration of its own dating from 1874. There is an *Althing*, or parliament, which meets twice a year at Reikjavik, the capital, and consists of 36 members, of whom 30 are chosen by popular suffrage, and 6 nominated by the king. A minister for Iceland, nominated by the king, is at the head of the administration, but the highest local authority is vested in the governor.

Some settlements of Irish monks had been made in Iceland about the end of the eighth century, but the island received the greatest proportion of its population from Norway. In 870 Harold Haarfager had made himself supreme in Norway, and as he treated the landed proprietors oppressively, numbers left the country and went to Iceland. In the course of 60 years all the habitable parts of the coast were settled. A settled government was established, a sort of aristocratic republic, which lasted for several centuries. Christianity was introduced in 981 and adopted by law in 1000; and schools, and two bishoprics, those of Holar and Skalholt, were established. The Latin language and the literature and learning of the West, introduced by Christianity, were all the more warmly received, because poetry and history had already been cultivated here more than elsewhere in the Germanic North. Previously to this time the Icelanders had discovered Greenland (983) and part of America (about 1000), and they were now led to make voyages and travels to Europe and the East. Politically and ecclesiastically the most flourishing period of Iceland—the period, too, when its intercourse with the world abroad was most active—was from the middle of the twelfth to the beginning of the thirteenth century. In 1264 Magnus VI of Norway united Iceland with his own kingdom, with which it passed to Denmark in 1380, remaining with the latter till 1814, when Norway was joined to Sweden.

The Icelandic language is the oldest of the Scandinavian group of tongues, and as it is believed to exhibit the Norse language nearly as it was spoken at the date of the colonization of Iceland, it is sometimes called *Old Norse*. It is rich in roots and grammatical forms, and soft and sonorous to the ear. Icelandic literature may be divided into an ancient period, extending to the fall of the republic, and a modern, extending from that date to the present time, the former being far the richest and most original. Poetry was early cultivated, and among the most important works in Icelandic literature is the collection of ancient heathen songs called the elder or poetic Edda. Histories and romantic works, known by the name of *Sagas*, are numerous. Many of these are masterpieces of prose style, and are still read with delight by the people of Iceland. The early portion of the second period was barren of anything worth mention in the way of literature, nor can the modern period boast at all of works possessing the interest of those belonging to the ancient, though since the mid-

dle of the eighteenth century there is scarcely a department of literature in which Icelandic writers have not done something. Many of the most valuable foreign works have been translated into Icelandic, and even the poems of Milton are read at many a cottage fireside. Pop. 72,438.

Iceland Moss, a species of lichen found in the arctic regions, and on the upper parts of lofty mountains, as for instance in Scotland. It is used in medicine as a mucilaginous bitter, and in Iceland is collected as a nutritious article of diet. When boiled with milk or water it forms a jelly. Its bitterness may be removed by steeping.



Iceland Moss.

Iceland Spar, the transparent variety of calc spar, a mineral noted for its property of exhibiting in a remarkable degree the double refraction of light.

Ice Plant, a plant which has received the above appellation from the transparent vesicles which cover its whole surface, and have the appearance of granules of ice. It is a native of South Africa and the Canaries, and is also found in Greece.

Ichneu'mon, a genus of carnivorous animals belonging to the civet family. They have a long slender body, a sharp and pointed muzzle, and short legs. The most celebrated species inhabits Egypt, where it is called *Pharaoh's rat*. It was adored by the ancient Egyp-

Egyptian Ichneumon.

tians on account of its antipathy to crocodiles, whose eggs it digs out of the sand and sucks. It is expert in seizing serpents by the neck so as to avoid any injury to itself. It is domesticated in Egypt, and more useful than a cat in destroying rats and mice. Their disadvantage, as domestic animals, is their predilection for poultry. The Mongoose, or Indian Ichneumon, is another species, not so large as the Egyptian, which it resembles in habits, being kept in many families as a useful domestic animal.

Ichneumon Flies, a large family of insects,

which all agree in one particular, that they deposit their eggs either in or on the bodies, eggs, or larvæ of other insects. These apparently insignificant creatures confer inestimable benefits on man, as they destroy hosts of insects injurious to crops.

Ichnol′ogy, the name applied to the modern science of fossil footprints, or other impressions on rocks. The impressions are almost always found on rocks that have been deposited as mud; they are not so common in sandstone, yet they abound in the new red sandstone strata.

Ichthyol′ogy, that branch of zoology which treats of fishes. Fishes form the lowest of the five classes into which the great subkingdom Vertebrata is divided. They may be shortly described as vertebrate animals living in water and respiring the air therein contained by means of gills or branchiæ, having cold red blood, and a heart consisting of one auricle and one ventricle; and having those organs which take the form of limbs in the higher vertebrata represented by fins. Their bodies are generally covered with scales overlapping each other, and their usual form (though with much diversity) is lengthened, compressed laterally, and tapering toward both extremities. A peculiar feature of fishes is the air-sac or swim-bladder, called also the *sound.* Anatomically its origin is identical with that of a lung; but it does not perform the function of a lung. Its function is probably to serve as an aid in rising and sinking; but in some fishes it is prolonged so as to approach or even come in contact with the internal organs of hearing, perhaps acting as an organ of resonance. Reproduction is by ova or eggs, which in a few cases are retained in the body of the female till hatched. The nervous system of fishes presents considerable variety. The amphioxus has no enlargement of the nervous trunk comparable to a brain, but in all the others the division into fore, mid, and hind brain is clearly marked. The olfactory organs are, in most cases, pits, or sacs, on whose walls the olfactory filaments are spread out. The sense of taste seems less provided for, the tongue and palate being mostly firm, and often set with teeth. There is no external ear, and the internal apparatus is not wholly enclosed in bone, as in the higher vertebrates, but is partly free in the cavity of the skull. The eye is, in most cases, relatively large and flattened externally, the sight being keen. Special organs of touch are wanting for the most part, though the labial filaments, seen in the cod, whiting, mullet, and sturgeon are of this nature.

Ichthyosau′rus (Greek, *ichthys,* a fish, *sauros,* a lizard), an immense fossil marine saurian or reptile, having an organization combining the characters of saurian reptiles and of fishes with some of the peculiarities of the whales. The members of this genus had four broad feet or paddles enclosed in a single sheath of integument, and a long and powerful tail. Some of the largest of these reptiles must have exceeded thirty feet in length. Their remains

range from the Lower Lias to the Chalk, and the great repository hitherto has been the Lias at Lynn Regis.

Icon′oclasts, image breakers, the party in the early Christian church that would not tolerate images, much less the adoration of them. At first images of martyrs and bishops were placed in the churches merely to keep their memory fresh, but latterly (in the sixth century) they began to be worshiped, lights being burned before them and incense offered in their honor. The Eastern Emperor Leo III issued an edict in 726 ordering the people to abstain from the worship of such images, and soon after he decreed their destruction. This caused great commotion, and there arose two parties in the church, the image worshipers and the *Iconoclasts,* or image breakers, who each in turn persecuted the other. In 754 a council at Constantinople condemned image worship; in 787 the second council of Nice (Nicæa) asserted and defined the doctrine. The controversy lasted over a century, coming to an end when, under the Empress Theodora, a council held at Constantinople (842) declared in favor of the worship of images among the Greeks, a decision which was confirmed by a second council, held 869–870, in the same place. In the Western Empire also images were at first retained only to preserve the memory of pious men, but the decision of the pope, which allowed the worship of images, finally prevailed in the Western Church. See *Iconolatry.*

Iconol′atry, the worship or adoration of the images of sacred personages connected with the Christian religion, as images intended to represent angels, the Virgin Mary, saints, martyrs, etc. Iconolatry must not be confounded with idolatry, which worships objects as being themselves divine or possessing supernatural power.

Icti′nus, an ancient Greek architect, chief architect of the Parthenon at Athens, 438 B.C.

Icy Cape, a cape of Alaska, in the Arctic Ocean, lat. 71° n., lon. 161° w.

Ida, in ancient geography: 1, A mountain range in the Troad (Mysia), at the foot of which lay the city of Troy. Its highest peak was Gargarus, about 4,650 ft. 2, The middle and highest summit of the mountain chain which divides the island of Crete from east to west. This peak affords a fine prospect, and is covered with woods of pine, maple, and cedar, but is not fertile.

Idaho, the 43d state in the Union, is bounded on the n. by British Columbia, e. by Montana and Wyoming, on the s. by Utah and Nevada, and on the w. by Washington and Oregon. It has a total area of 86,300 sq. mi. The surface is generally mountainous. The Rocky Mountain range extends along the east and northeast border for about 250 mi. Fremont's Peak, which has an altitude of 13,570 ft. is on the boundary between Idaho and Wyoming. Minor ranges occur in different parts of the state and the scenery in many places is grand and impressive. The mountainous parts are well wooded and the soil of the valleys and

lowlands is fertile. The principal river is the Snake, the south fork of the Columbia. It has numerous falls, the principal ones being the American, Shoshone and Salmon. Salmon, Clear Water, and Spokane rivers are branches of the Snake. Other rivers are Boise, Greene, Payette, and Lapwai. Boise Valley is 2,800 ft. above the ocean.

Climate.—The climate is characterized by great aridity of atmosphere and slight rainfalls. In the south there are large areas which are almost desert. In the mountainous regions of the north the rainfall is much greater and agriculture is carried on to some extent without irrigation. The mean temperature of northern Idaho is 56°. Boise City has an average temperature of 51°.

Vegetation.—The northern part being principally mountainous, is covered with forests of conifers, generally a species of pine, spruce, fir, and tamarack. In the open valleys, vegetation consists chiefly of various kinds of grasses known as bunch grass. The plains generally produce good pasturage, and in the valleys broad stretches of meadow land produce, with irrigation in some cases, good crops of wheat, oats, barley, and common fruits and vegetables. On the Snake River plains there is little vegetable growth except artemisia, but the country s. and e. of the Snake River is covered with this and with grasses and a little scattered timber.

Mining.—Gold and silver are found in large quantities in Idaho, especially in the vicinity of the Salmon, Boise, and Clear Water rivers. Limestone is found near Clear Water River and other places, and a valuable grade of sandstone in the mountains. Lead and copper are also produced to a considerable extent. The census of 1890 placed Idaho third among the states in the production of lead. At some points in the state there are deposits of coal and iron, and in the southeastern part is found soda, carbonates, magnesia, sulphur, and salt. A great many sheep are raised in Idaho. The annual value of the wool clip is about $2,000,000.

Manufactures.—In 1890 the value of manufactures in Idaho was $1,396,096. There are about 1,000 mi. of railroad in the state, and a little over 1,000 mi. of telegraph.

Education.—The institutions of higher learning are the university of the state of Idaho, located at Moscow, and state normal schools at Albion and Lewiston. The common school system has been well provided for, and there are about 31,000 school children in the state. The state institutions are an insane asylum and penitentiary. The deaf, dumb, and blind are sent to Colorado Springs, Col. The state pays for their keeping at that place. There is also a soldiers' home.

History.—The first white men in Idaho were Lewis and Clarke, who made explorations there in 1805–6. Gold was discovered on the Oro Fino Creek in 1858–60, and in 1863 Idaho was created a territory. Idaho became a state in 1890. The principal cities are Boise City, Montpelier, Bellevue, Wallace, and Caldwell.

The population in 1900 was 161,771. Popular name, *Gem of the Mountains.*

Governors.—Wm. H. Wallace, 1863–64; Caleb Lyon, 1864–66; David W. Ballard, 1866–67; Isaac L. Gibbs, 1867–68; David W. Ballard, 1868–70; Gilman Marston, 1870–71; Thomas W. Bennett, 1871–75; Mason Brayman, 1877–78; John P. Hoyt, 1879; Mason Brayman, 1880; John P. Neil, 1880–83; John N. Irwin, 1883; Wm. N. Bunn, 1884–85; Edward A. Stevenson, 1885–89; George L. Shoup, 1889–90; G. L. Shoup, 1890; N. P. Willey, 1891–92; W. J. McConnell, 1893–97; F. Steunenberger, 1897–1901; F. N. Hunt, 1901–1903.

Id'desleigh, Stafford Henry Northcote, first earl of (1818–1887), English statesman. He was educated at Baliol College, Oxford, became private secretary to Mr. Gladstone in 1843, and was called to the bar in 1847. In 1851 he succeeded his grandfather in the family baronetcy. He published a treatise, *Twenty Years of Financial Policy*, in 1862. He was made special commissioner to America to arrange the *Alabama* difficulty. Subsequently he was secretary for India (1867–68) and chancellor of the exchequer (1874–80). Upon Mr. Disraeli's elevation to the peerage he became leader of the lower house, his task being all the more difficult on account of the parliamentary obstruction of the Irish Home Rule party. He was elected lord rector of Edinburgh University in 1883. Lord Salisbury having undertaken to form a government, he was created (1885) earl of Iddesleigh, and became first lord of the treasury.

Idea, as a term in mental philosophy, has been used in various senses. Plato regarded ideas as the archetypes or original models of things, as existing from eternity and constituting the patterns according to which the Deity fashioned the various things of which we become cognizant by our senses. According to Plato, ideas were independent of matter, and it was they that were the only objects of true knowledge. Aristotle opposed Plato's doctrine of independent ideas, but held the doctrine of ideas being types or patterns accompanying material things. By Descartes and many modern philosophers the word is employed to signify all our mental representations, all the notions which the mind frames of things. See also *Idealism.*

Ide'alism, the philosophical term which, in contradistinction to *realism*, expresses the view that subjective or ideal existence is not only the original but the only true being, and according to which there is allowed to sensible objects merely a phenomenal existence dependent upon the mind of a thinking subject. In modern times idealism has been maintained by Descartes, Berkeley, Kant, Fichte, Schelling, and Hegel.

Iden'tity of person in point of law must often be proved in legal proceedings, as in proving a thief, etc. The usual proof is the oath of one who was cognizant of the facts at the time referred to. A common defense of persons accused of crime is that it is a case of mistaken identity, in which case the prisoner must

usually prove an *alibi*, i.e., that he was in some other place at the time specified.

Ides (Latin *Idus*), with the Romans, the fifteenth day of March, May, July, and October. In the other months the thirteenth was the ides. The *ides* of March, on account of Cæsar's assassination having taken place on that day, was an *ater dies*, or black day, and the senate was not allowed to sit. See *Calendar*.

Id'iot, a person who, from original defect, is almost destitute of intelligenee, or in whom the intellect seems to be almost wholly wanting. In some cases the intellectual development is so low that there appears to be little more than a vegetative life. Others not quite so low in the intellectual scale recognize the persons with whom they live, are capable of being affected by certain emotions, understand a few questions, articulate a few words, and are able to take their own food, but are quite unable to do any kind of work. Those endowed with a little more intelligence may sometimes be employed in some kinds of labor which present no complicacy or difficulty, but they are incapable of performing any intricate calculation or going through any long train of reasoning. The brain of idiots is sometimes sufficiently regular in its conformation, although in the great majority of cases there is something abnormal. The forehead is often depressed, receding, and flattened; sometimes the back part of the head disproportionately large. The majority of idiots are of small stature and of weak constitution, rarely living beyond 40 years. The causes of idiocy are not well known. It may be hereditary.

Idol'atry is the worship of an image, object, or symbol as having in itself some divine or supernatural power, and being able in some way to respond to the worship paid to it, such images or objects being called *idols;* or the adoration of something merely natural as something supernatural and divine. Many have regarded idolatry as a declension from the one true God, and have seen in the various forms of heathen worship only more or less complete degradations of an original revelation. Others see in idolatry an innate searching after God, and regard it as the first stage of human development, the necessary beginning of a knowledge of God. Idolatry may assume various forms; it may consist in a worship of the powers of nature or of the heavenly bodies, or in animal worship, or in the worship of images representing mere fanciful and imaginary deities, or in the still lower fetichism.

Idun (or Iduna), a goddess in the Scandinavian mythology, wife of Bragi, keeper of the apples of which the gods ate to keep themselves young.

I'dyl (from Gr. *eidyllion*, a "little image"), is the name originally and still most usually applied to a short and highly finished descriptive poem, especially if it treats of pastoral subjects, though this last circumstance is not an essential character of the idyl. All that is necessary to constitute a poem of this class is that it presents to view a complete picture in small compass.

Ieisk (or Yeisk), a seaport of Russia, on the Sea of Azoph. It was laid out only in 1848, but has rapidly increased, and now has nurseries, tanneries, tile works, oil mills, soap works, etc., and a considerable trade. Pop. 29,529.

Ieletz (or Yeletz), a town of Russia, gov. of Orel, at the confluence of the Ieletz and Lutchka. It has flourishing manufactures, and an extensive trade. Pop. 36,250.

Ig'lau, an old town of Austria, the largest in Moravia next to Brünn, on the Iglawa, 49 mi. w.n.w. of Brünn. The staple manufacture is woolen cloth. Pop. 22,378.

Ignatieff, NICHOLAS PAULOVITCH (1832–), Russian soldier and diplomatist, b. in St. Petersburg. He served in the Crimean War, and was made a colonel 1856. In 1858 he was sent on a special mission to Bokhara and Khiva, and afterward as ambassador to Peking, 1860. He was appointed minister at Constantinople 1864, and was envoy extraordinary 1867–78. He was conspicuous in the negotiations before and after the Russo-Turkish War, and was appointed minister of the interior, but was dismissed 1882. Subsequently made governor general of Irkutsk.

Ignatius, ST., Bishop of Antioch, one of the apostolic fathers, said to have been a disciple of the apostle John. His life and death are wrapped in fable. According to the most trustworthy tradition he was appointed Bishop of Antioch A. D. 69, and was thrown to wild beasts in the circus of Antioch by the command of Trajan, the date being given by some as A. D. 107, by others as A. D. 116.

Igneous Rocks, in geology, rocks which are seen to owe their special character or structure to their materials having been once in a state of fusion, as lava, basalt, granite, etc. Such rocks are not stratified, and may occur in connection with sedimentary rocks of any age, having usually been forced up from below.

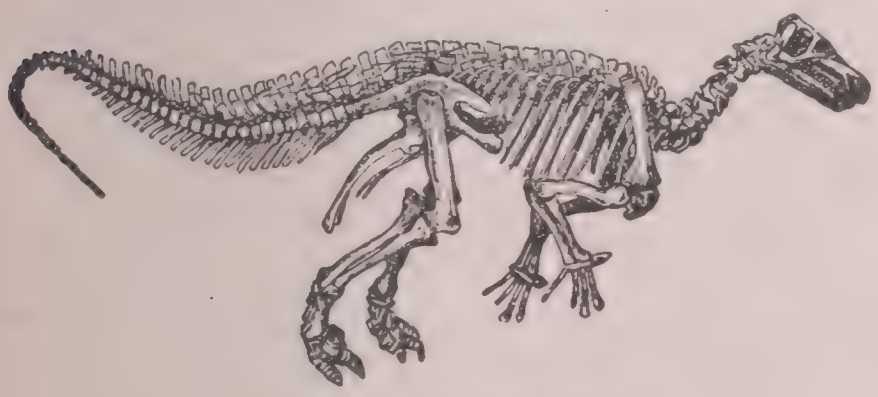
Ignis Fat'uus (L. "foolish fire"), a luminous appearance seen floating over marshy places at night, and sometimes, it is said, in churchyards. It is probably due to some gaseous mixture capable of igniting spontaneously, but it has never been satisfactorily explained. Other names are *Will-o'-the-wisp* and *Jack-o'-lantern.*

Iguan'a, a genus of lizards, a native of Brazil, Guiana, and neighboring localities. It has an average length of about 4 ft. Its food consists almost entirely of fruits, fungi, and other vegetable substances. Its head is large, the mouth wide. Along the whole length of the back to the tip of the tail there is a crest of elevated, compressed, pointed scales; the lower part of the head and neck is furnished with a dewlap or throat pouch. The toes are furnished with sharp claws, which enable it to climb trees with ease, while a rapid serpentine movement of its tail propels it swiftly through the water. Its usual color is dark olive green. Its flesh is considered a delicacy, being tender and delicately flavored, resembling that of a chicken. The eggs, of which the female lays from four to six dozen, are also eaten, having

an excellent flavor. They are about the size of those of a pigeon, are laid in the sand, and hatched by the heat of the sun.

Common Iguana.

Iguan′odon, an extinct fossil colossal lizard found in the Wealden strata; so called from the resemblance of its teeth to those of the iguana. The pelvic bones were strikingly like those of birds. The integument does not seem to have possessed the spines or bony plates of allied species. The anterior vertebræ, were slightly amphicœlous, the posterior flat. The lower jaw was notched for the reception of the beak, as in the parrot. The teeth large and broad, implanted in sockets, and transversely ridged. Mantell, its discoverer,



Skeleton of Iguanodon.

estimated the length of the animal at from 60 to 70 ft., but Owen's calculation is 30 ft.

Il′iac Passion, an ailment regarded by some as a distinct disease, though it is, in fact, the last stage of the severest forms of colic, and is often produced by mechanical obstruction. Acute pain, frequent vomiting, and hiccough are the chief symptoms. It is often fatal. Dilatation of the bowels by the bellows may produce good results; as a last resort, gastronomy may be attended with success. The disease is also called *Ileus.*

Il′iad. See *Homer.*

Il′ion. See *Troy.*

Il′ium. See *Troy.*

Ilk′eston, a market town of Derbyshire,

England, 9 mi. e.n.e. of Derby. Manufactures of hosiery and lace are here carried on, and a number of the inhabitants are employed in mining coal and ironstone. Pop. 19,744.

Ille-et-Vilaine (ēl-e-vi-lān), a maritime department in the n.w. of France, lying between the English Channel and the department of Loire-Inférieure. The minerals include iron, zinc, and lead. The principal manufactures are leather, sail cloth, sacking, and coarse linens, and the coasting trade is active. Rennes is the capital; St. Malo the chief seaport. Pop. 626,875.

Illimani (il-yi-mä′nē), one of the loftiest peaks in the Bolivian Andes, fully 21,000 ft. high, and covered with glaciers.

Il′linois (il′i-noi or -nois), one of the Central states, bounded on the n. by Wisconsin, e. by Lake Michigan and Indiana, s. e. by Kentucky, from which it is separated by the Ohio, and w. by the Mississippi, separating it from Missouri and Iowa; greatest length 370 mi.; greatest breadth 210; area 56,650 sq. mi. The greater portion of the state is level plain. The surface is more uniform than that of any other state in the Union. It is intersected by numerous streams bounded by bluffs and skirted for some distance on either side by woods, the general character of its conformation being rather a succession of prairies than one continuous plain. The state is drained by the Mississippi, and its tributaries, the Ohio, Kaskaskia, Illinois, and Rock rivers. The only lakes of any note are Pichtaka in the n. e., and Peoria Lake, a widening of the Illinois River.

Climate.—The temperature is more nearly normal than that of almost any other state, owing to the absence of external modifying agencies. There are no mountain ranges to protect from the sweep of meteorological changes, nor are there within her bounds, if we except the great lake on the northeast corner, any agents to produce those changes. The climate is generally salubrious, becoming yearly less malarial as the soil is broken up and drained. Occasionally the thermometer takes a plunge below zero, but the mean annual temperature is about that normal to a district situated in its latitude. The summers are generally pleasant, the atmosphere over its vast levels generally being in motion, and affording cooling breezes even in the highest flights of the mercury.

Vegetation.—The great crops of Illinois are Indian corn, wheat, and hay, and much attention is also given to the raising of live stock. Other crops are rye, oats, barley, buckwheat, potatoes, and tobacco. The trees most abundant are oak, black walnut, sugar maple, ash, elm, locust, hickory, persimmon, pecan, cottonwood, sycamore, buckeye, tulip, poplar, beech, and black birch. There is also some yellow pine, cypress, and cedar. The state is rich in fruit trees, among them being apple, peach, pear, plum, cherry, and apricot, and the smaller fruits, strawberries, raspberries, and blackberries.

Education.—Illinois has a well equipped common school system. In 1895 there were 875,-

000 pup'. enrolled in the public schools. There are also 118,000 in private schools. The total cost of public schools was about $15,000,000. Colleges in the state are, Hedding College, Illinois Wesleyan University, Northwestern University, University of Chicago, McKendry College, Chaddock College, Ewing College, Shurtleff College, Blackburn University, Lake Forest University, Lincoln University, Monmouth College, Carthage College, Augustana College, St. Viateur's College, St. Ignatius College, St. Francis Solanus College, Northwestern College, Westfield College, Wheaton College, Lombard University, Eureka College, University of Illinois, Austin College, Northern Illinois University, Knox College, Grear College, and Illinois College. Illinois charitable, reformatory, and penal institutions include institutions, for the education of the blind, and for the deaf and dumb; Illinois Central Hospital for the Insane; Illinois Asylum for Feeble-minded Children; Illinois Soldiers' and Sailors' Home; Illinois Soldiers' Orphans' Home; Illinois Eastern Hospital for the Insane at Kankakee; Illinois Northern Hospital for the Insane at Elgin; Illinois Southern Hospital for the Insane at Anna, and an Asylum for Insane Criminals: Charitable Eye and Ear Infirmary. Other charitable institutions are the Home for the Blind, and the Industrial Home for Girls, both at Chicago. The state penitentiaries are located at Joliet and Chester, and a reformatory school at Pontiac. In 1896 there were about 1,700 newspapers published in Illinois, of which 160 were dailies, 2 tri-weekly, 29 semi-weekly, 1,250 weekly, 6 fortnightly, 33 semi-monthly, 205 monthly, and 15 quarterly. Others were published more or less irregularly.

Manufactures.—In its manufactures Illinois ranks third in the Union, the value of manufactures being about $1,000,000,000 annually. The abundance of coal, the proximity of the iron and copper mines of Lake Superior, the unlimited means of transportation, the supply of lumber, the cheapness of food, and the supply of water power in various parts of the state, have all contributed to the success of the Illinois manufacturer. The iron and steel establishments rank with the largest in the country. Chicago is the manufacturing center of the West and almost every article known to American manufactures is produced.

Mining.—Coal is first among the minerals of the state. The coal area is estimated at 45,000 sq. mi. There are fifty mines which produce 50,000 tons or more per year. The most important coal-producing counties are St. Clair, Sangamon, Madison, LaSalle, Peoria, Macoupin, Vermillion, Livingston, Fulton, Jackson, and Perry. The annual production of coal in the entire state amounts to about 10,000,000 tons. There are extensive lead mines near Galena in the northwestern part of the state. Salt springs are found in the southeastern counties and excellent building stone in various parts of the state. Limestone, known as "Lemont marble," is found near Chicago and is largely used for building.

Railroads.—Illinois has more railroads than any other state, with a total mileage of 10,214 in 1890. They are so located and interlaced that there are few localities more than ten miles from a railway. There are over fifty lines of railroad in the state, all the principal ones centering in Chicago. The first railroad in the state was the Sangamon & Morgan, part of which was open to traffic in 1839. The estimated total cost of construction and equipment of all the roads exceeds $400,000,000. In addition to the railroad traffic, there is a large business done by steamboats at Cairo, East St. Louis, Alton, Quincy, and Rock Island, and other points on the Ohio and Mississippi rivers. The Illinois & Michigan Canal is 93 mi. long and connects Lake Michigan at Chicago with the Illinois river at the head of navigation. The new Chicago Drainage Canal will probably be used sometime as a commercial water-way.

History.—The first white settlements in Illinois were made by French from Canada, under the lead of the explorer Sieur de La Salle, although Louis Joliet and Father Marquette had been in the territory previously. They ascended the Illinois River and reached Lake Michigan by way of the Chicago and Desplaines rivers in 1673. La Salle and his companions erected a fort named Crevecœur on the east shore of the Illinois in 1680, and built Fort St. Louis on Starved Rock on the Illinois near Utica in November, 1682. The French settlers maintained the most friendly relations with the Indians. In 1673, the English, by the conquest of Canada, succeeded to dominion over this region. At the close of the Revolutionary War this territory was ceded to the U. S. and was included in the Northwest Territory. Illinois was the fourth territory which was organized as a part of the original Northwest Territory. It was organized as a separate territory in 1809, with state government at Kaskaskia. It was admitted to the Union in 1818. In 1832 the trouble with the Sacs and Foxes and other tribes of Indians culminated in the Black Hawk War, and the result was the final removal of all the Indians from the state. In 1834 Congress granted an appropriation for the improvement of the Chicago harbor, and the following year the Illinois and Michigan Canal was projected. All the work of internal improvement came to a standstill with the panic of 1837. Trouble with the Mormons arose in 1840, when they removed from Missouri to Nauvoo, Ill., where they erected a temple. In 1844 two of their leaders, Joseph and Hiram Smith, were confined in Carthage jail. The jail was surrounded, and the Smiths were both murdered. Soon afterward Mormons, numbering 20,000, left the state under the leadership of Brigham Young. Illinois contributed six regiments for service in the Mexican War. In 1850 Congress granted lands for the construction of the Illinois Central R. R. During the Civil War about 260,000 Illinois men joined the Union army. The chief events in Illinois history since the war were the Chicago fire in 1871, and the anarchist riot in 1886. The pres-

ent constitution was adopted in 1870. The principal cities are Chicago, Peoria, Alton, Aurora, Belleview, Bloomington, Cairo, Danville, Decatur, E. St. Louis, Elgin, Evanston, Freeport, Galesburg, Jacksonville, Joliet, Kankakee, La Salle, Moline, Ottawa, Quincy, Rockford, Rock Island, Springfield, Streator. The population in 1900 was 4,821,550, ranking third in the Union. The popular name is *Prairie* or *Sucker* state.

Governors.—Shadrach Bond, 1818–22; Edward Coles, 1822–26; Ninian Edwards, 1826–30; John Reynolds, 1830–34; Joseph Duncan, 1834–38; Thomas Carlin, 1838–42; Thomas Ford, 1842–46; Augustus C. French, 1846–53; Joel A. Matteson, 1853–57; Wm. H. Bissell, 1857–61; Richard Yates, 1861–65; Richard J. Oglesby, 1865–69; John M. Palmer, 1869–73; Richard J. Oglesby, 1873; John L. Beveridge, 1873–77; Shelby M. Cullom, 1877–83; John M. Hamilton, 1883–85; Richard J. Oglesby, 1885–89; J. W. Fifer, 1889–93; J. P. Altgeld, 1893–97; J. R. Tanner, 1897–1901: Richard Yates, 1901–

Il'linois, a river in Illinois, formed by the union of the Kankakee and Des Plaines, in the n.e. part of the state of Illinois. It flows thence s.w., and falls into the Mississippi about 20 mi. above the mouth of the Missouri. It is 500 mi. long, half of it being navigable. A canal connects the river with Chicago.

Illyr'ia (Illyr'icum), a name formerly rather loosely applied to a large tract of country on the e. side of the Adriatic, the ancient Illyrians being the ancestors of the modern Albanians. The name of Illyrian Provinces was given, by a decree of Napoleon in 1809, to Carniola, Dalmatia, and other countries, then part of the French Empire. After the fall of Napoleon the Illyrian Provinces were restored to Austria, and designated as the kingdom of Illyria, a title which the country bore till 1849, when it was divided into the provinces of Carinthia, Carniola, and the Coast lands.

Ilo'rin, a town in the Western Soudan, about 150 mi. n.e. of the Bight of Benin in Nupe, a great center of trade; pop. 150,000, mostly Mohammedans.

Image Worship. See *Iconolatry.*

Imaginary Quantity, in algebra, such a quantity as $-a^2$ in the equation $x^2=-a^2$, when to find the value of x we should require to take the square root of $-a^2$; and this is impossible. Any algebraic expression containing $\sqrt{-1}$ is called an imaginary expression. The employment of imaginary quantities systematically has been the foundation of some of the greatest modern discoveries and improvements in geometry.

Imagination, literally that faculty of the mind by which we can form mental *images* of things. Besides the power of preserving and recalling such conceptions, the imagination has the power to combine different conceptions, and thus create new images or mental pictures. It is this faculty which is more strictly termed imagination. In the creation of new images, or more properly in the combining of images which have previously been derived from objects of perception, the imagination operates according to the laws of the association of ideas. Its operations are nevertheless not wholly independent of the will, for by directing the attention to some leading thought, the will can determine the limits within which the laws of association are to act. Such free and yet regulated action of the imagination alone can give birth to the productions of the fine arts.

Imam (i-mäm'), a class of Mohammedan priests. In Turkey they attend in the mosques, call the people to prayer from the minarets, perform circumcision, etc. In ecclesiastical affairs they are independent, and are not subject to the mufti, though he is the supreme priest. They may quit their office and re-enter the lay order. The sultan, as chief of all ecclesiastical affairs, has the title of *imam.*

Imbecility, weakness of mind such as puts a person considerably below the general run of mankind, but not so great as to be called actual lunacy or idiocy, nor so well marked perhaps as to be classed under any one of the forms of insanity. Imbeciles sometimes display a considerable amount of intelligence in certain directions and are often very cunning. They may be interesting, amusing, and even useful members of a community. Equity will not set a contract aside on the mere ground of imbecility; but its existence affords a material ingredient in examining whether it has been obtained fraudulently or by undue influence. As a general rule the court is ready to support the obligation of any contract that a person of weak mind has entered into, unless it is of such a nature that a person of sound mind would not have agreed to it, or unless there is suspicion of fraud. An imbecile person may be summoned as a witness, but the degree of credibility attaching to his evidence naturally depends very much on the amount of intelligence he displays, and on the nature of the circumstances regarding which his evidence is offered.

Immortality, exemption from death; the state of everlasting life. The dogma of the immortality of the soul is very ancient. It is connected with almost all religions, though under an infinite variety of conceptions. By the immortality of the soul we understand the endless continuation of our personality, our consciousness, and will. There are so many reasons to render immortality probable, that with most nations the belief is as clear and firm as the belief in a God; in fact, the two dogmas are intimately connected in the minds of most men. The hope of immortality must be considered a religious conviction. Reason and religion command man to strive for continued perfection. This duty man cannot relinquish without abandoning at the same time his whole dignity as a reasonable being and a free agent. He must therefore expect that a continuation of his better part, as the necessary condition for his progress in perfection, will not be denied to him. Hence the belief in immortality becomes intimately connected with our belief in the existence and goodness of God. Among rude peoples the life after death

is usually regarded as a state of being not essentially different from the present—one in which the hunter shall renew his chase, and his corporeal senses shall have their accustomed gratifications. Among the ancient Greeks and Romans the spirits of the dead were believed to live in the other world as a sort of shadows, and the life after death was also considered as a shadow of the present. Among some peoples the imagination attributes changes of condition to the future life, and the doctrine of transmigration, or the progress of the mind or soul in different stages, is developed. Connected with the belief in the immortality of the soul is the belief in a state where souls are purified after death, as existing among the Egyptians and many Christians.

Impalement (Lat. *palus*, a stake), the putting to death by thrusting a stake through the body. This manner of inflicting death was known to the Romans, though not practised by them. It is still practised some in half civilized countries.

Impeachment, a calling to account of a public officer for maladministration. In the constitution of the U. S. the procedure of impeachment is thus brought about. The House of Representatives are the accusers, and appoint managers to conduct the prosecution at the bar of the Senate. The vote of the Senate is taken by putting the question separately to each member, and a majority of two thirds is required for a conviction. In the separate states it partakes of the same quasi-political character—neither the prosecutors nor the judges being the same as in ordinary criminal offenses. The most noted instances of impeachment in the U. S. are those of Associate Justice Chase in 1804, of President Andrew Johnson in 1868, and of Judge Barnard, New York, in 1872. The object of impeachment is the removal of public officers for malversation in office, which is followed sometimes by disqualification for any future appointment.

Impera'tor, among the ancient Romans, a term originally applied to a military commander, one who held the *imperium*, or military power. In later times no one received this title who had not defeated a hostile force of at least 10,000 men. After the overthrow of the republic, *imperator* became the highest title of the supreme ruler, and acquired the signification which we attach to the word *emperor*. It was still given, however, to triumphant generals, and, in this case, has its old signification. The emperors appear to have used it because they were considered as superior to all the generals.

Impey Pheasant, a bird of the pheasant family, remarkable for the splendid colors and metallic lustre of the plumage of the male, whence it is called in India (of which it is a native) *monaul*, meaning bird of gold. It is found in the high and cold regions of the Himálaya, and is of the size of a small turkey. It obtained the name of Impey pheasant from the fact that Lady Impey was the first who attempted (unsuccessfully) to introduce the bird alive into Europe.

Impost, 1, a tax, tribute, or duty, particularly a duty or tax laid by government on goods imported. 2, In architecture, the point of junction between an arch, and the column, pier, or wall, on which it rests. It is often marked by horizontal moldings, though these may be absent. Imposts have received various names, according to their character. Thus, a *continuous impost* is where the moldings are carried down the pier; a *discontinuous impost* where there are no moldings, but the pier is of a different section from the arch; *shafted imposts* are where the arch moldings spring from a capital and differ from those of the pier.

Impressment of Seamen, the act of compelling persons, especially seafaring men, to serve in the English navy. The power of impressing seamen, though still existing, has fallen into abeyance since the conclusion of the general war in 1815. Impressment was of ancient date, and uniformly practised throughout a long series of years. It is also recognized in many statutes, such, for instance, as exempted certain persons from impressment, though the power of impressing is not expressly granted in any acts of Parliament.

Imprisonment, the restraint of a person's liberty, whether in a prison, the stocks, or by merely keeping in custody. It is usually inflicted by way of punishment, the power of sentencing to imprisonment being conferred on certain courts or magistrates, and strictly limited by law. A person may be imprisoned, however, who is merely accused of a crime, in which case he can demand to be released on bail.

Improvvisato'ri, the name given in Italy to persons who compose and declaim extemporaneously a poem on any given subject, or sing it, accompanying their voice with an instrument. This has long been a practise in Italy, and many of the *improvvisatori* have acquired considerable celebrity. The poet Metastasio at a very early period showed an extraordinary talent for this kind of composition, but the exercise of it cost so much effort that from a regard to his health he was obliged to give it up. Even at the present day Italy abounds in this class of poetical composers.

Ina'gua, GREAT and LITTLE, two islands, the former about 40 mi. from the eastern extremity of Cuba, low and intersected with lagoons, and affording good pasture land; area 660 sq. mi.; pop. 1,500. Little Inagua is quite small.

Inaja' Palm (*Maximiliana regia*), a South American palm growing to the height of over 100 ft., with leaves 30 to 50 ft. long, and from 10 to 12 ft. wide. The spathes are so hard and woody as to serve for cooking food on the fire; they are also used as baskets, etc. The fruit is edible.

Incarnation (Lat. *in*, and *caro*, *carnis*, flesh), a word used to express the manifestation of the Deity in the flesh under the human form; thus we speak of the *incarnation* of Christ. The Hindus believe in innumerable incarnations of their deities. The most celebrated are the nine incarnations of Vishnu.

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